The Builder.

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Building Stones of the Madras Presidency, North-West Provinces, and Oudh.

THE recently-issued part of the "Records of the Geological Survey of India"* contains an interesting account of the mineral, &c., resources of the above-mentioned provinces of our Indian empire, by Mr. W. King, B.A., D.Sc., director of the survey. Much attention is given to the clays and building stones, a brief description of which might be useful to some of our readers.

Commencing with the resources of the *Madras Presidency*, we find that fine pottery, pipe and plastic clays exist in various parts of the country, extensive beds of high-class white or pale clays occurring, especially in the Upper Gondwana (Rajmehal) series. The Kuppam clays have yielded good results at the Madras School of Arts; whilst fine white clays are also found near Guntur, and china-clay (kaolin) comes from Nilgiri, North Arcot, and Vizianagram. Brick and tile factories are established at Calicut and Tirivaloy, the clay being obtained from the river beds of the neighbourhood.

Granites, gneisses, and other highly crystalline rocks are extensively developed in the Presidency, being largely utilised for building and ornamental purposes. Granites of many tints occur in Anantapur and Guti-Taluks, and first-class stone can be obtained at several places in the Bellary district. At Hampi there are many remarkable ruins, showing fine carvings in local granite, and many notable monoliths of great size. At Palaveram, Cuddaparai, and Patanpalam highly hornblendic gneisses are very largely quarried for articles of domestic use; the first-mentioned place also yields the rubble-stone used in the Madras harbour works. Granite is extensively raised at Tirukari and Seven Pagodas; whilst good stone is found in Kistna district, very handsome in colour and texture, and taking a fine polish, especially that at Kondavidu. Red granite occurs in Madura, and here also a pale-banded hornblendic rock is largely worked for temple pillars. In North Arcot beautiful and useful granites and gneisses abound—that from Sholingar is much used in Madras. A porphyritic stone is found on the western flank of Yailagiri, in Salem; and pale granitoid rock with pink garnets is extensively raised at Waddakarai, in Tinnevelly district. Quarries west of Perambalur village, in Trichinopoly, produce the black hornblendic stone of which the great Tanjore bull and other fine monoliths are said to be made.

Laterite is a very common rock in many parts of the Madras Presidency, occurring along the coasts and stretching over vast expanses inland, and is the ordinary building stone of the country. We may pause for a moment to describe this remarkable material. The rock laterite does not admit of a very clear diagnosis: it is exceedingly variable in composition, having been derived from several different formations. Frequently it is red and earthy, occurring in beds lying between basalt and other lava flows, and in some instances it results from their decomposition. Generally it appears to be an alluvial formation of gravel and conglomerate cemented more or less by a ferruginous paste—usually sesquioxide of iron—and has been laid down in comparatively recent geological times, inasmuch as flint implements of human manufacture have been discovered in it. It has been employed for building purposes from early times in Orissa, Midnapur, Trichinopoly, and Tanjore, and was much used in the construction of temples and other ancient structures. Laterite is largely quarried in Madras, amongst other places, at Shahkotai, in Madura district, and at Nellore, where the stone is very good.

Limestones of different kinds are also extensively developed in the Presidency. Near Coimbatore a crystalline limestone is found of pink and grey tints (almost white in places), which takes a high polish, and is admirably adapted for interior decoration. At Narji, in Cuddapah district, we get flaggy and thin-bedded limestones of shades of grey, blue, buff, and fawn, and some are nearly black. These were largely employed in the construction of the Madras Railway; the black variety, known as "Narji Stone," is also used for ornamental purposes in Madras; it takes a fine polish, and is stated to be specially useful for interiors. Near Namakal large deposits of pink, grey, and white limestones of excellent quality exist, and in Trichinopoly is found the well-known shelly marble of that name. Magnesian limestones, 12 ft. to 14 ft. in thickness, of yellow-buff and brownish-red colours, predominate in the Godavari district. At Tutikorin, rock-coral is, curiously enough, used for coarse building purposes; and lime is commonly manufactured from the sub-recent shell-beds in the backwater deposits, and from kunkar, which occurs locally.

The Presidency also contains several sandstones of good quality. Amongst others, we may mention those of Cuddapah and Godavari. In the latter district, at Tundkalpudi, a buff granular felspathic rock, exceedingly durable,—a most useful stone,—is found. Near Guntur red and purple sandstones are obtained, which, to judge by old ruins, were much esteemed by the Jains; and to this day they are extensively quarried by the Public Works Department. The same department also utilises the hard greenish, or blueish-black calcareous sandstones, found near Budavada, in Kistna. At Valimukkam, in Madura, a great quarrying industry once existed, large masses of calcareous, gritty sandstone having been raised and shipped, probably to the great temple at Rameswarum; whilst at Sivagunga, in the same district, the working of the dark, purplish-grey, hard grits, with brown bandings, still gives employment to a number of natives. Flags are found and dug at Razpudi, seventeen miles N.N.E. of Ongole, in Madura. Several calcareous sandstones occur at Panamparai, in Tinnevelly, of a fine, cream-coloured or brownish tint, which were used in constructing the great churches at Megnanapuram and Mudalur, as well as the large temple at Tiruchandur, on the coast, south of Tutikorin.

No true slates are found in the Madras Presidency, though small, rough slabs are procurable. The many kinds of trap rock furnish good materials for road-making and rough building.

Turning now to the resources of the *North-West Provinces and Oudh*, we find that pottery and tile clays abound, whilst pipe clay exists as an extensive deposit at Kol Garhaia, in Banda. Comparatively few of the highly crystalline igneous and metamorphic rocks are drawn upon; but at Almora mica-schist,

* Part 3, vol. xxiii. (1890), p. 130 *et seq.*

and at Naini Tál clay-schist are used as building stones. At Ranikhet a pale-coloured gneiss forms a handsome and lasting material.

The aqueous rocks, however, are common enough. Amongst limestones we get the peculiar tufaceous, or travertine rock known as kunkar (or dant), which is the prevailing building stone of the North-West Provinces. Quarries in this deposit occur all over the Aligarh district, where block kunkar costs a rupee per hundred cubic feet to quarry, and 8 annas per mile for transport. It is also distributed over the Cawnpur district, but the quarries near the city are, it is stated, becoming exhausted. Other kinds of limestone are locally raised.

Fine sandstones are quarried near Agra, and we learn that the more valuable ones, those for instance at Tántpur, Basai-Jagner, and Baghaur are worked by members of the carpenter (Barhái) caste. Each man pays the lord of the manor a seignoralty which, according to the locality and the colour of the stone, varies from 2½ rupees to 4½ rupees yearly. The price of fine sandstone at the quarry itself is, for the white or grey variety, 7 rupees; and for the red kinds, 5 rupees to 6 rupees per hundred maunds. The price at Agra of the best stone from Khairagarh is, for the grey variety, about 50 rupees or 52 rupees the hundred maunds; and for the red, about 34 rupees to 35 rupees. Large quantities of sandstone are sent from Chhibún-pargunnah to Allahabad and vicinity. The Chunar (Mirzapur) stone is famous all over India, and is said to be unsurpassed in fine grain, compactness, and size of blocks; it is usually of a pale buff colour, and takes the most delicate carvings and mouldings.

It is an unfortunate circumstance that, as in Madras, no slates comparable with those of North Wales occur in any part of the immense territory under consideration; but clay-slates of inferior quality are raised here and there.

ADJOINING OWNERS UNDER METROPOLITAN BUILDING ACT.

THE question as to the person who falls within the term "adjoining owner" within the meaning of the Metropolitan Building Act, 1855, is one of considerable practical importance. Intentionally, or not, no definition has been given by the Legislature of this term, though by section 85 three months' notice must be given by a building owner to an "adjoining owner" before he can do ordinary work to a party structure. If any omission occurs in regard to this notice, the consequences are serious, and, therefore, it would have been much better if the Legislature had had the courage and the wisdom to state who should be considered an "adjoining owner." As it is, judicial decisions must be perused in order to find out what persons are covered by the term. We propose briefly to refer to these decisions, since a recent one of much importance has lately been reported in the "Law Reports" for the present year. The case to which we refer is that of Fillingham *v.* Wood, which was decided by Mr. Justice Chitty. Fillingham occupied a shop and parlour with a workshop adjoining, the front kitchen, and a back bedroom on the third-floor in a house at the West-end of London. These premises were held under an agreement for a term of three years. The landlord of the house held a long lease from the Crown, but only occupied the front room on the third-floor, part of the house being let to another person, who occupied the rooms which were not let to Fillingham. No notice under the Metropolitan Building Act, 1855, was given to Fillingham in regard to work to a party-wall; the building owner merely serving the notice on Smith. Mr. Justice Chitty held that notice should have been given not only to Smith, but also to Fillingham. It is clear, therefore, from this decision that a person in possession or occupation of a part of a house under an agreement for a greater period than a year is "an adjoining owner" within the meaning of the Act. In section 3 of the same statute an owner is stated to be "every person in possession or receipt either of the whole or of any part of the rent or profits of any land or tenement, or in the occupation of such land or tenement other than as a tenant from year to year, or any less term, or as a tenant at will." But while this section speaks of profit, of part of a tenement, it does not say "in occupation of part of a tenement." Therefore, the result of the case now under review is that the definition of "adjoining owner" must be the above, with the insertion of the words "or in the occupation of part of a tenement." This, of course, throws greater responsibility on the building owner, since he has to make more careful inquiries as to the person who must be served with notice before the doing of work to a party structure. A case somewhat the reverse of the last one, namely, Hunt *v.* Harris, decided a good many years ago, should be referred to in connexion with this recent decision. It arose on the 97th section of the Metropolitan Building Act, but to a large extent it helps to a definition of the words "adjoining owner" in regard to the service of notices. In this case, the lessee of a house for ninety-nine years who sub-demised part of it for various smaller terms, though the sub-tenant held for a longer term than year to year, was held liable to contribute to certain expenses. That decision makes the lessee under a long term an adjoining owner, even though the owner in fee simple may also in the eye of the law be an adjoining owner as well as the tenants of various parts of a building. Again, the case of Cowen *v.* Phillips, decided by the late Lord Romilly, decided that a person having an equitable interest, as under an agreement for a lease, was an adjoining owner. The plaintiff in that case was in possession of a shop and parlour under an agreement for a lease—in other words, he had only an equitable interest in the premises. Moreover, the house was divided into two, so that, apart from the question of equitable interest, it differed in its facts from Fillingham *v.* Wood. But if we read this latter case and Cowen *v.* Phillips together it shows that a person in occupation of part of a building under an equitable title is an adjoining owner within the meaning of the Metropolitan Building Act, 1855. The result of the current of judicial decisions has, therefore, been to enlarge considerably the definition of "adjoining owner," and to throw on the building owner the burden of giving notice to every person, whether landlord or tenant, unless he be merely a tenant from year to year or for a less period. It would seem, in fact, not to be safe to abstain from serving any person other than a mere lodger with notice of the intention to do work to a party structure.

NOTES.

THERE is no position in which philanthropists as a rule show to less advantage than in their no doubt well-meant endeavours, from time to time, to act the part of the champion of the over-worked railway servant. As a general rule, the champion knows nothing whatever of railway work, and proposes reforms which are impracticable in principle, based on conclusions which are not founded on fact. Mr. Channing's demonstration on Friday last week in regard to overtime on railways was no exception to this rule. His resolution included the principle that the Board of Trade should interfere to limit hours in a service which from its very nature must be to a great extent elastic in its arrangements, and stigmatised as "a grave social injustice" the so-called infliction of overtime on employés who, as is absolutely testified by those who have the best means of knowing the truth, are so desirous to claim overtime and its extra wages that stringent regulations have had to be passed and enforced to prevent their doing so under circumstances when it might have been easily avoided. Sir Michael Hicks-Beach, in his very sensible and impartial speech, referred to the fact that drivers have such an attachment to their own engines that they would in many cases prefer to work extra hours rather than let a deputy on to the foot-plate. But of this kind of feeling the doctrinaire philanthropist is not likely to know much. The excuse for Mr. Channing's demonstration of course is the Scottish railway strike, a movement in which, whatever grievances they may justly have had to complain of, the men have put themselves directly in the wrong; firstly by breaking their contract with their employers, secondly by public violence. If the company, to gain some end of their own, had broken their contract with the men, what indignation would have been aroused in the philanthropic ranks! But for the men to break their contract with the company apparently is a virtue, and a proof of spirit and independence. The philanthropists assert that public safety requires that the men be not overworked. Railway managers may reasonably reply that public safety demands that discipline should be maintained among an immense body of men whose co-operation is necessary for the working of the great machine of railway traffic. Sir Michael Hicks-Beach's resolution to the effect that the employment of railway servants for excessive hours is a danger both to themselves and to the public (a proposition which every one will admit), and that a Select Committee should be appointed to inquire "whether and in what manner the hours worked by railway servants should be restricted by legislation," is a more reasonable way of putting the subject, laying it open for inquiry without endorsing the principle of government interference which might be either impracticable or mischievous; and as Mr. Channing's motion was defeated, we presume that the President of the Board of Trade stands morally pledged to carry his amended resolution into action at the earliest opportunity.

THE Bill introduced by the Government to establish a Commission for Scotland to whom private Bill business should be referred in place of a Parliamentary Committee, was not received as well by some of the Scotch members as was to have been expected. The composition of the Commission seems satisfactory enough: the legal and the commonsense element are fairly mixed. It must be a better tribunal than an ordinary Parliamentary Committee, and it has the further advantage of being a body which will transact Scotch business in Scotland. The idea of some members of the Opposition seems to be that the work of the Commission might be done in some way by the Municipal bodies. We cannot concur in the wisdom of this suggestion. In many cases municipal bodies are either the promoters or the opposers of private Bills. What is needed is a thoroughly impartial and competent tribunal. Hitherto, public works have been free from the jobbery which is rampant in France and in America. If municipal bodies had the power of granting or refusing the doing of public works in the nature of railways, waterworks, and so forth, local lobbying would at once spring into being. If the composition of the Commission can be improved, well and good; but the principle and general form of the Bill is right.

A DEPUTATION which waited upon Sir Michael Hicks-Beach last Friday, representing the Central Chamber of Agriculture, obtained a definite declaration from the President of the Board of Trade regarding railway terminals. The deputation were told that there was no necessity for them to enter into an argument upon the subject, because, so far as the Board of Trade was concerned, their minds were made up. They had come to the conclusion that they ought to accept the principle, and propose it to Parliament. It has been apparent for some time that the Board of Trade had determined upon this

course, but, so far as we know, this is the first time that this determination has been publicly avowed. There is still a very strong feeling that the Board are mistaken in their view of the matter, and further efforts will probably be made in Parliament to defeat the railway companies on this point. Sir E. Birkbeck, M.P.,—who introduced the deputation alluded to,—singled out the Great Eastern Railway for commendation; stating that they are conciliatory to all traders, and remarking that the other companies might well take example by them. The Great Eastern were the only company specifically mentioned, and, singularly enough, a letter has recently been published on the subject of railway rates, in which the writer similarly refers by name to this company alone, but in the following terms:—"The Great Eastern Railway are doing their best to strangle traffic, for they not only charge exorbitant rates, but they alter the invoices of other railways so as to raise the charge." This rather grave accusation appears side by side with Sir E. Birkbeck's "honourable mention" in an agricultural contemporary for the current week.

IN reference to some remarks in this column about the Soane Medallion last week, we find we were in error in supposing that it is a trust fund, the Medallion and the 50*l.* being provided from the Institute funds as a prize founded in memory of Soane. This would of course give a different aspect to the feeling which we were told existed in the Institute as to not liking to keep back the money, though we think the Council could afford to disregard any imputation of interested motives on that head, if they were ever made. We are also informed that for two years the time for study abroad has been reduced from six months to three, and is to be so this year, but we imagine this is not at all generally known, for our remarks were in fact made in consequence of a conversation with a competitor for one of this year's prizes, who said that he would like above all things to go in for the Soane, but "could not afford it," partly in consequence of the six months' stipulation. The reduction of the time makes this easier, though we would rather see the full six months' study kept up and the endowment doubled, and in that view beg to repeat our suggestion that any wealthy man who wishes to encourage architectural study could not do so better than by bestowing an additional endowment on the Soane Medallion. Failing that, would it not be worth while to consider the advisability of making the competition biennial, and concentrating 100*l.* on each award, as it seems that the annual competition with 50*l.* fails to evoke all that is desired? There is a precedent for this in the case of the Royal Academy, one of the best prizes in connexion with that institution being given at intervals of two years.

IT is to be hoped that there will be a good meeting at the Institute on Monday evening to hear Baron de Geymüller's paper on "Bramante," and to do honour to a distinguished French student of architecture, for such we believe Baron de Geymüller is, in spite of his German-looking name. He has devoted his attention to the study of unpublished drawings and documents in connexion with eminent Renaissance architects, and we noticed some time since his valuable and interesting monograph on "Bramante and St. Peter's" (*Builder*, March 5, 1881). The paper, we presume, will be read in English, for Baron de Geymüller adds to his other accomplishments that of being an excellent linguist.

WELCOME to an old friend, too long missed! Once more we have the pleasure of seeing the familiar yellow wrapper of the *Revue Générale de l'Architecture*, which had ceased to appear for so many months that its best friends had almost given it over. A legal contention between the proprietors and the printers has been, we believe, the cause of this lengthened suspension, which in England would spell ruin to a periodical publication, but in France subscribers take these things more philosophically, or perhaps have a greater feeling of loyalty to their favourite publication. The new number of the *Revue* is somewhat brief in literary matter, but it contains no less than fourteen finely-executed plates, including an interior at the Château St. Leger, another at the Château de Cheverny, a remarkable doorway from the Gozzadini Palace at Bologna, a series of comparative plans and sections of Art Museums, and various illustrations of domestic and other modern work.

THE January number of the Palestine Exploration Fund's *Quarterly Statement* is largely occupied with Herr Schick's account of his recent investigations, including a discovery of an ancient bath and cistern near Bethany, an examination of the remains of the "Second" Siloah aqueduct, and a search for the St. Peter's, or, as it is called, the "cock-crow" church on Zion. In the course of this latter search a Roman mosaic floor was found, of which an illustration is given, apparently part of some bath buildings. The bricks in connexion with it have a stamp on them. Herr Schick says "We learn from them that these baths were made in the midst of the ruins by the Roman soldiers of the tenth legion. As such are found elsewhere also, as I have reported from time to time, it would seem that this legion was stationed for a long time at Jerusalem, and perhaps that their tools for brickmaking may have been used afterwards by others, possibly even by the natives."

WE hear that Mr. Elliot Stock will publish a series of volumes, to be edited by Mr. T. Fairman Ordish, F.S.A., under the name of the Camden Library. The books will treat upon various subjects connected with British antiquities and archæology. The issue for this year is to consist of "Curiosities and Antiquities of the Exchequer," wherein Mr. Hubert Hall, F.S.A., of our Public Record Office, deals with the Exchequer House and Court, and what may be called the "Civil Service" of a by-gone day; "Old London Theatres," being a history, by the editor, of the theatres in London from the times of the Burbages to their suppression by Parliament in 1647; "English Homes in the Past," by Mr. Ralph Nevill, F.S.A., whose several articles upon cottage architecture will be remembered by our own readers; and an instalment of Camden's own work, "Britannia," with the valuable county maps, and Holland's translation (1610). Among succeeding volumes, the following are announced:—Mr. W. H. St. John Hope's "Monastic Arrangement;" Church Plate, by Mr. St. John Hope, F.S.A., and Mr. T. M. Fallow; one by Mr. J. J. Foster, upon Miniature Portrait Painting; and another upon English Armour, by the Hon. H. A. Dillon, F.S.A.; a treatise upon Parochial Church Life in Mediæval England will be undertaken by the Rev. Dr. Cox, editor of the *Antiquary*, and author of "Derbyshire Churches," &c.; a volume, entitled "Folk Lore," by the editor and Mr. G. L. Gomme, F.S.A., Director of the Folk Lore Society. A set upon the manners and customs of the English people, at different epochs, will form a complement to Mr. Nevill's work; and Mr. Drummond-Milliken will tell the story of the streams of London. The books, post 8vo. size, and illustrated and indexed, will be issued quarterly.

A MEETING of the united Vestries of St. Mary Woolnoth and St. Mary Woolchurch Haw was held last week, to consider the City and South London Railway (Islington Extension) Bill. Under that Bill power is sought to take the Church of St. Mary Woolnoth, together with its graveyard. By reason of its position and design, both within and without, this church, standing in Langbourne Ward, is one of the most striking, as it is certainly the most original, of the eighteenth-century London churches. The Lombard-street front, without windows, is different from the south. The work of Nicholas Hawksmoor (and finished in 1727), it is said to have inspired Servandoni's and Maclaurin's work at St. Sulpice, in Paris. The latter—the Temple of Victory during the Revolution—was begun in 1646, but was not completed until seventy-five years afterwards, *teste* Murray.* The interior was re-arranged in 1875-6, under the superintendence of Mr. Butterfield, architect, when the galleries were removed, and their ancient front panelling fixed against the walls. The organ, against the north wall, east end, by Smith, 1681, was rebuilt by Messrs. Gray & Davison twenty-three years since. For some months in 1886 the church was closed owing to the insanitary condition of the vaults below; under the direction of Mr. F. C. Penrose, the under surface of the vault arching was covered with iron joists, and concrete overlaid with two ½-in. thicknesses of asphalte. St. Mary Woolnoth is the parish church of the Mansion House, which covers the site of St. Mary Woolchurch Haw, by the Stocks Market, in the graveyard of which the aulnagers used to supervise the weighing of wool. Built on the site of a traditionary temple of Concord, the original church of St. Mary Woolnoth (re-built in 1620, and repaired by Wren) is cited as early as 1274 in Dr. Sharpe's Calendar of Wills proved and enrolled in the Court of Husting (Part I., 1889), whereby Geoffrey Godard devises to the church half a mark annual rent for arrears, and to his eldest daughter, Johanna, his capital house in the parish. Writers differ as to the origin of Woolnoth: in the *Athenæum* of March 31, 1888, Mr. J. H. Round propounds his theory about "the obvious derivation . . . from the Anglo-Saxon Wulfnoth," of whom we would gladly know more, and says he has found the name as Wlnotmaricherche in a deed of 1191; some derive it from wool hithe,—but the wool wharf lay near to the Tower. "Note" signified business or traffic; and the church's connexion with the wool trade seems to obtain general acceptance. Hawksmoor, upon Gibbs's resignation, was appointed surveyor (with J. James) to the Commissioners for building the new churches, January 6, 1716. He thus was architect of St. Anne, Limehouse, restored 1851-4 by Morris & P. Hardwick; St. George-in-the-East; St. George, Bloomsbury; and Christ Church, Spitalfields. The working drawings for all these are in the British Museum. For his grave, and its stone, at Shenley, Herts, see the *Builder*, vol. xx., pp. 562 and 590.

THE second number of the Transactions of the Edinburgh Architectural Association, just issued, contains some interesting papers on old monuments, including one by Mr. MacGibbon on Tantallon Castle. There is a paper on the New Town of Edinburgh, forming the valedictory address by the President, Professor Baldwin Brown, who defends the regularity and uniformity of design of the New Town, as more in keeping with what was required than any attempt to emulate or imitate the picturesque irregularity of the Old Town. A similar view was taken in a paper read by the editor of this journal at the Edinburgh Congress of the National Art Association, at which it was maintained also that the regular lines of the New Town formed the best possible contrast with, or base for, the irregularities of outline and plan in the Old Town.

WE have received the seventh annual report of the Manchester Technical School, which seems to be both prospering itself and becoming the cause of prosperity in others. It is gratifying to read, in the report of the boys' commercial and manual training school, that the school has, in many instances, "helped to determine the pupils' aptitudes, and fix their career. Many who under ordinary circumstances, would have simply swelled the overstocked ranks of clerks

* For Servandoni's share in the design of St. Sulpice see our review, on January 28, 1888, of Mr. Augustus J. C. Hare's "Paris." The towers are 231 ft. high, exceeding those of Notre Dame by 9 ft.

and warehousemen, have, under the stimulus and training they have received, entered upon some business where manual skill and dexterity are essential conditions of success." The school is doing an excellent work if it helps beginners in life to take part in some work requiring special skill, instead of drifting into that vague profession of clerkship, which too often is taken to merely because a boy has no knowledge, talent, or training that would fit him for anything better.

WE have referred in another note to the debate in the House of Commons last week on railway overtime. The illogical ideas prevalent on this subject were further illustrated in a short conversation in the House of Lords on Monday, when Lord de la Warre moved for a copy of the report to the Board of Trade on the railway accident at Wortley on December 24 last, as belonging to a class of accidents due to the overworking of employés. It was a fact that the engine-driver had been on duty eighteen hours, during most of which time however he had been stationary on account of a dense fog, but he had nothing to do with the accident, the blame of which rested with a signalman who had only been on duty seven-and-a-half hours.

VARIOUS improvements have recently been made in hansom cabs. The recent models are more comfortable generally, they have noiseless wheels, doors that are opened by the driver from his seat, and occasionally a pneumatic signal to direct the driver, though this last requirement must be of rather rare occurrence, as in an extensive use of cabs we have only come across it in two instances. But there are two simple improvements very obviously called for, and which seem to have been entirely overlooked. The first is a shield for the front portion of the wheels. In muddy weather it is exceedingly difficult for a woman, or for a man wearing a long overcoat, to get in or out of a hansom without carrying away some mud from the tire of the wheel on their dress. A leather dirt-shield placed over one-quarter of the periphery of the wheel would at a small cost prevent this annoyance. The other matter we refer to is more serious, as it is a question of danger to the occupant of the cab. As every one knows, the front window in a hansom can only be let down and pulled up by the driver, at the request of the occupant conveyed through the trap-door. This is very inconvenient in any case; but in the case of a horse running away or becoming restive it adds materially to the chance of injury to the occupant. Not long since we met a cab with a runaway horse careering wildly along Great Marlborough-street, with the glass down and a lady inside. Fortunately the horse was pulled up at the corner without any harm being done; but if he had either fallen or run into anything, the lady must almost inevitably have been thrown forward with her face through the glass, and been perhaps dangerously injured, or disfigured for life. The driver, even if he thinks of it (which he probably does not), cannot draw up the window at the moment, for he is fully occupied in trying to guide and to pull up his horse. On which account all hansom-cab windows ought to be fitted so that they can be raised or lowered by the occupant without the assistance of the driver. If attention is not paid to this by the builders and owners of cabs, we hope that the licensing authorities will take some steps to compel the adoption of this very necessary improvement, which there can be no practical difficulty in carrying out.

WE ought perhaps to notice the fact that Mr. Wall, the builder who came so prominently before the public in connexion with the building of the Kilburn-lane Schools for the London School Board, has had his discharge as a bankrupt suspended for four years, on the ground of grave misconduct in his business. Whether this sort of punishment is of much general deterrent effect may well be doubted; on the other hand, it is quite just that a bankrupt who has traded recklessly or has been guilty of misconduct should not be discharged with the same ease as a bankrupt who has failed purely through misfortune.

THE original Dean Free Church, Edinburgh, erected shortly after "The Disruption," has recently been deserted by the congregation for a new structure further west, and has been acquired by Mr. W. G. Stevenson, the sculptor, and by him converted into a studio. Mr. Stevenson thus reverses the practice of olden times, when the temples of the gods were converted into churches. It is somewhat startling to see a colossal statue of Wallace occupying the place of the pulpit, and Venus and the Graces attitudinising in the aisles.

THE Corporation of Leith have acquired a portion of ground at Starbank which is to be converted into a public park. In the course of the operations there was dug up what was considered a specimen of an ancient iron "joug," or collar, in which offenders against ecclesiastical discipline in Scotland were at one time compelled to stand at the church doors, or other public places, to do penance. The article was found about 2 ft. under ground, and was taken to the Town Council Chambers, where it excited much interest and speculation; one member of Council, it is said, having suggested that it might form "the nucleus of a Municipal antiquarian museum." The interesting object, however, turns out to be a hasp used for the adjustment of the mast of a fishing-boat, such as may be seen in use at the present time. A well-preserved specimen of a "joug" remains attached to the wall at the entrance to Duddingstone Church, near Edinburgh, and one or two examples exist in other parts of Scotland.

THE water-colour drawings by Mr. G. S. Elgood, now exhibited at the Fine Art Society's Gallery under the title "A Summer among the Flowers," turn out to be a very charming collection indeed. The subjects are of the most fascinating kind, being mostly scenes in the gardens of well-kept old mansions, in full summer; and the execution of many of them is beautiful. No. 12, showing part of an old house with its grass-lawn and flower-beds, is one of the best; "The Time of Roses" (18) is a large drawing showing part of a garden enclosed in massive architecturalised yew hedges, with a luxuriant bed of roses in the foreground, which are most beautifully and delicately painted; "Compton Wynyates" (24) is excellent not so much in detail as in general picturesqueness and true open-air effect. There are many other beautiful nooks most lovingly painted, among the seventy drawings, which make an exhibition well worth a visit.

BRITISH ARCHÆOLOGICAL ASSOCIATION.—At the meeting on Wednesday, January 21, Mr. J. W. Grover, F.S.A., in the chair, various antiquities were exhibited, including some curious Dutch tiles, found in pulling down Nos. 210 and 211, Piccadilly. The first paper read was by Mr. C. Lynam, on the carvings of the curious font at Lapley, Staffordshire, a remarkable and hitherto but little-noticed work of early Norman date. The paper was illustrated by plaster casts and drawings. The second paper was by Dr. Russell Forbes, read, in the author's absence, by Mr. W. de Gray Birch, F.S.A. It detailed the recent discovery of two temples of Etruscan date at Faleria. The subject was illustrated by a great many photographs of the objects which have been brought to light. Others were also exhibited of some of the most recently-found art works of Rome, where the progress of the new works are constantly bringing to light not only portions of the ancient buildings, but of statues and other sculptures.

BYZANTINE ARCHITECTURE.*

BY PROFESSOR AITCHISON.

ALTHOUGH iron has been used largely for various structures, it is not likely that in our time and in our country it will take the place of more time-honoured materials,—at least, for monumental buildings. Its contraction and expansion under the influences of cold and heat require special arrrangements not always easy to provide; from its rapidly conveying heat, and thus condensing the moisture of our atmosphere, it is objectionable for inhabited structures; from its liability to rust it has to be constantly oiled, varnished, or painted, for as yet the "Barff" process has been little used; while in a conflagration the behaviour of iron is simply disastrous.

We must, therefore, still look to the employment of marble, stone, burnt brick, terra-cotta, concrete, mud, and timber, for the main part of architectural structures. Every architectural structure of these materials is necessarily full of lessons for the architect, for there must have been the requisite conditions to fulfil in its plan and elevation, *i.e.*, the arrangements for the particular exigencies of the building, and the space and lighting required by the climate, as very different provisions must be made for a building in the North of Scotland, where damp, mist, rain, and snow prevail, from those required in a building for the dry and burning air of Egypt, or for the deadly heat and torrential rains of India.

The construction of every building must, too, have been adapted to the materials employed, while its æsthetic conditions must, at least, have been three-fold.

In the first place, the national or local ideas had to be embodied; in the second place, the prevailing taste had to be satisfied, as far as pure architecture was concerned; and, in the third place, the ornament had to be such as appealed to the taste and knowledge of the people; by the word ornament, I mean not only floral ornament, but figure-sculpture, painting, and mosaic. The execution must also have been adapted to the prevalent light and atmospheric conditions. We see, for example, that all the details of Greek buildings are designed for bright sunshine and a clear air; nothing is tamer and less effective than Greek architecture in England; and though Gothic details are admirably suited to a misty climate, they would doubtless look vulgar and obtrusive in a sunny one. At certain times a near approach has been made to perfection in these particulars, and such architecture is called *Classic*. There have, however, been epochs in architecture which are peculiarly capable of affording us instruction, as we are constantly having fresh material wants to satisfy, fresh appliances to use, fresh adaptations to make, and we are eagerly expecting the rise of a national æsthetic want to satisfy too. In many ways the most instructive epochs for us are those in which buildings have been required for new purposes, when the old traditions of construction have been improved upon, and when the canons of art have been changed. Any one of these new conditions may cause such modifications in buildings as to make them the forerunners of a new style, and when all of these conditions are present the new style has the highest claims on our attention. There are other considerations outside the former which invest a style with extrinsic interest, which may be roughly given as follows:—When it has prevailed for long periods of time over vast tracts of the earth, and when it has been the groundwork from which other styles have arisen, I have, therefore, chosen Byzantine architecture for my present course of lectures, as it fulfils all the conditions mentioned.

The heathen world had become Christian by Imperial edict, and the requirements of a new worship had to be provided for. The dome became an almost essential part of an important church, so that different canons of proportion were necessarily applied to these new domed structures, and a new style of ornament was adopted. Next, as to the prevalence of the Byzantine style, after the founding of Constantinople it was used in all new buildings erected, during a certain period of its existence, from Britain to the Tigris, and from the Rhine and the Danube to the shores of Africa; it lasted at Constantinople and in the lower Empire for a thousand years. Not a century

* Being the first Royal Academy Lecture on Architecture this session. Delivered on Monday evening, January 26, 1891.

after the Byzantine style had arrived at its perfection, in the days of Justinian, the Saracen invasion called for its application to the building of mosques and minarets for the Mussulman faith; though, so admirably did the Christian churches suit the new faith, that a large proportion of them were converted into mosques.

At a later time it had with the Roman and Romanesque of the West an important influence on the emergence of Gothic. In using the terms Roman and Romanesque it may be necessary to give some sort of rough definition, and some sort of arbitrary distinction, for all living architecture is gradually progressive, but its progression is not always in a direct line. Though architecture mainly depends on the active use of the architect's mental powers and on his native capacity, it also depends on the requirements and cultivation of those for whom it is done, and on the existing type; architecture may progress on one or two, or on all of its three main lines, *i.e.*, that of æsthetic excellence, that of planning, or that of construction. I think we may roughly call Roman all buildings executed in Rome, or for the Romans up to the early part of the fourth century A.D.,—*i.e.*, up to Constantine's dedication of Byzantium as the new capital of the Empire in 330 A.D., though what we now call Byzantine methods had begun to be adopted long before that date. Though buildings were erected by the Romans in various parts of Europe after the sacking of Rome in the fifth century, we hardly call any building Romanesque that was not built by or for the Barbarians who had overrun the West of Europe. The word "Romanesque" was first used by De Caumont early in this century as defining the round arched architecture of the Dark and Middle Ages, before Gothic had sprung up. The word Romance or Romanesque was originally applied to architecture much as it was to literature, and meant the current Roman method of building as the others did the Roman vernacular.

Byzantine architecture has, too, another claim on our attention, as it sprang up at a time when the art of Rome was at its lowest state of degradation, and not a century before the inroads of the barbarians had begun to disorganise society, and the dark ages were about to set in in the West. Byzantine architecture may be said to be pre-eminently Christian, just as Gothic may be called Roman Catholic architecture. Byzantine architecture did not technically begin until Christianity had become the State religion, and the capital of the Roman Empire was transferred to Byzantium. But every art and science in this world slowly progresses from small beginnings; the sharp stone fixed in a cleft stick led the way to the chipped flint tied on to a handle, this to the polished stone weapon, this to the bronze weapon, and finally to the steel one. Nothing is made by man out of nothing; there is, of course, the primary invention or discovery, this discovery or invention is slowly improved upon up to a point, and then the concurrence of many favourable circumstances causes the progression to be rapid; circumstances change, and the progress is scarcely perceptible, or is stopped altogether. The Romans, who valued nothing but fighting, oratory, law-making, and husbandry, treated with contempt those who designed their buildings, modelled their statues, or painted their pictures, who, for the most part, were slaves or freedmen, and scarcely deigned to mention their names, much less to give an account of their works, though we have, it is true, a letter of young Pliny to his supposed architect Mustius, and an epigram of Martial on Rabirius, the architect to Domitian's palace. It is only by knowledge and reflection that we are sure that buildings which seem to be brilliant inventions must have been copies of existing ones, enlargements of smaller ones, or developments from similar buildings with which the Roman architects were acquainted. If we did not know this, some epochs in Roman architecture would be marvellous,—the Pantheon, for instance. We are not even sure of the name of Agrippa's architect, who designed the Pantheon; it has been attributed to Valerius of Ostia, and to L. Cocceius Auctus, but we feel certain that whoever he was he was well acquainted with large domed structures before he undertook the Pantheon, and that this experience was probably gained in Persia. Architecture is so obtrusive an art that its great creations stamp themselves on the mind, and any striking work is sure to be reproduced time after time. The dome of the Pantheon was not only the prototype of many Roman and Byzantine structures, but has been copied and paraphrased even to our own time.

Byzantine architecture was but the logical conclusion of all those gradual changes and improvements in Roman construction which converted it from a post-and-lintel style into a perfect vaulted and domed one, only this transformation was quickened at Byzantium by the larger employment of Greek and Oriental architects, possessing different tastes and different experiences from their Roman compeers.

No sooner did Constantine the Great (272-337) transplant the capital of the Roman empire to Byzantium than he was in headlong haste to make this small city surpass Rome in architectural magnificence, and to erect imposing monuments in honour of his new faith; for he believed that through his conversion he had obtained absolute power. Directly he began his improvements, he not only found that the excellent organisation and method of Rome was unknown there, but that there was, too, a dearth of architects, builders, and foremen, and of that vast army of artisans which is wanted to build, decorate, and furnish a structure. In one brief he says:—"We want the greatest possible number of architects, but they fail us,* and he gives a list in another brief† of thirty-five master artificers who are to be freed from taxes if they come there and teach their sons. It may be interesting to hear the names of the professions and trades that were required. They were:—

Architects	Marble masons
Ceiling makers	Gilders
Plasterers	Founders
Carpenters	The next word is "blattiarii;" whether these were blackbeetle-killers, dyers of silk in purple, or goldbeaters, I must leave you to determine
Doctors	
Stone-cutters	
Silversmiths	
Builders	
Mule doctors	Tessilators
Mosaic cutters	Goldsmiths
Gold embroiderers	Mirror makers
Staircase hands	Carriage builders
Painters	Levellers with the water-level
Sculptors	
Filigree workers, or pearl-piercers	Glass-blowers
Inlayers	Ivory-workers
Statuaries	Fullers
Mosaic workers	Potters
Braziers	Plumbers
Blacksmiths	Furriers.

Gibbon says, "The impatience of Constantine soon discovered that in the decline of the arts the skill as well as the number of his architects bore a very unequal proportion to the greatness of his designs. The magistrates of the most distant provinces were therefore directed to institute schools, to appoint professors, and, by the hopes of rewards and privileges, to engage in the study and practice of architecture, a sufficient number of ingenious youths, who had received a liberal education." (Gibbon "Decline and Fall," c. 17.)

The infusion of Romans and Roman methods into Byzantium must have given a Roman stamp to the new part of the city of Constantine's days; but most of the buildings he had erected were done in such haste and so badly, and were of such perishable materials, that time, earthquakes, and conflagrations soon destroyed them.

Zosimus (Lib. 2) says:—"As he expended the public treasure in unnecessary and unprofitable buildings, he likewise built some which in a short time were taken down again, because, being erected hastily, they could not stand long."

The proximity of the capital to Greece and to Asia Minor almost necessarily caused a great influx of Greeks and Orientals, anxious to make their fortunes, or to gain distinction in the new capital, and there can be no doubt that architects were included in this immigration.

We know that as early as the time of Trajan (98 to 117 A.D.) most of the architects employed in Rome were Greeks, for in his letter to Pliny the Younger, then Governor of Bithynia, he says:—"As there is no province that is not furnished with men of skill and ingenuity, you cannot possibly want architects; unless you think it the shortest way to procure them from Rome, when it is generally from Greece that they come to us" (Lib. 10, let. 49).

Constantine and his more immediate dependants, I presume, spoke Greek and Latin, though the language of Byzantium must, I think, have been Greek, as it had been a Greek republic before its conquest by the Romans. Greek was probably the *lingua franca* of those parts, for after Alexander the Great's conquests the kings of Asia Minor, Syria, and Egypt were Macedonians, and, though the Macedonian language was incomprehensible to Greeks, it is probable that Greek was the court language. One never heard of any Macedonian literature, and the brilliant, versatile, polished, and hungry Athenian, the *Græculus esuriens* of Horace, was almost sure to make his way to high posts. Athens in those days was like Florence in the Middle Ages; Pope Boniface the Eighth said Florence was the fifth element. We know that as early as the beginning of the second century B.C., Cato the Censor learnt Greek, partly, no doubt, to teach his son a language that was necesary for a nobleman to speak. In the first century B.C., the great Lucullus was equally familiar with Latin and Greek, and wrote his history of the Marsian War in Greek. Some scholars think that the celebrated "Et tu, Brute!" of Julius Cæsar, when he was stabbed, was said in Greek, and translated into Latin for patriotic reasons. Plutarch wrote his "Lives" for Trajan in his native Greek tongue; Martial also, in the first century puts Greek into the mouths of Roman ladies; in the second century the Emperor Marcus Aurelius wrote his "Thoughts" in Greek; and one of the charges against Maximinus the First in the early part of the third century was that he was wholly ignorant of the Greek language. The Emperor Julian wrote his Philosophical Essays in Greek in the fourth century, and Ammianus Marcellinus in the same century was the last Roman writer who used Latin. After him all the Eastern authors wrote Greek, until we read in the "Arabian Nights" of a man speaking Greek like a Roman.* The fact of Greek being the language of the lower Empire has caused many writers to call it the Greek Empire, and the Romans Greeks. It is not in my province to determine whether the Romans of the Byzantine Empire became Greeks in their thoughts and actions, but it is undoubtedly the case in architecture that the versatility and suppleness of the Greeks supplanted the rigid adherence to rule that so distinguished the Romans. Viollet-le-Duc and M. Choisy insist on Byzantine architecture showing strong characteristics of the Greek mind.

We saw last year in the Palace of Diocletian, probably built about the beginning of the fourth century, that the architect had begun to use arches springing from architraves, platbands, or blocks over the columns, and in one case even from Corinthian capitals themselves, showing that an important step had been taken towards the Byzantine style. M. Choisy believes that Diocletian's architect was able to dome the Temple of Jupiter without centering, so the art of doming must have made great strides as well, and, as it is stated that upwards of eighty domes fell down during Constantine's reign (306-337 A.D.), the architects must have been getting knowledge in the most practical way, just as the experience so gained in the twelfth century was used by the thirteenth-century architects.

Little or nothing remains of the buildings at Constantinople of Constantine's time. His baths at Rome have been destroyed, though we have Palladio's drawings of them; but the magnificent basilica of Maxentius and Constantine's baptistery, and the tombs to his mother Helena and his sister Constantia, as well as his Triumphal Arch, remain; and there still exists a church he had built near Prœneste, dedicated to St. Marcellinus and St. Peter, much after the fashion of the Temple to Portunus at Ostia. He is said to have had built in Palestine, the nave of the basilica at Bethlehem, and the dome of the rock at Jerusalem, over the supposed tomb of our Saviour, commonly called the Mosque of Omar. St. George, at Thessalonica, is believed, by some, to have been built in the time of Constantine; I believe it to be later. It is very much like the church of St. Marcellinus and St. Peter, only with a bema or sanctuary added. This I think is evidence of its being of a later date, though Constantine once proposed to make Thessalonica the capital of the empire.

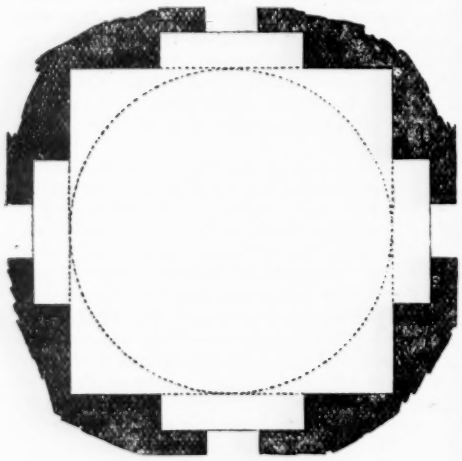
The most striking peculiarity of what we now call Byzantine architecture is the Pendentive, by means of which a circular dome may be erected over a square plan; and so distinctive is this of the style,—at least after the time of Justinian,—that M. de Verneilh takes it as the true test of Byzantine architecture in the West.

* "Codex Theodosianus," L. 13, Tit. iv. 1, A.D. 334.
† "Codex Theodosianus," L. 13, Tit. iv. 2, A.D. 337.

* The Romans of the Moslems were those of Constantinople.

All the architectural students know that pendentives are those portions of a dome that are left when the remainder is cut off by the vertical sides of a square, and form four spherical triangles between the four great arches that pierce the side of the square, that the diameter of the dome so cut is equal to the diagonal of the square, and that the joints of pendentives are more or less normal to the curve, for pure corbelling does not form a true pendentive.

The first mention that I recollect of early Western pendentives is in Texier & Pullan's "Byzantine Architecture," 1864 (introduction, page 9), where those in Caracalla's baths (211 A.D.) are mentioned. These were found in the one remaining octagonal hall, at the north end of the north-east apse of the enclosure; and, from a sketch M. Choisy has been kind enough to give me, the pendentives seem to be groined.* M. A. Choisy† also informs me he has no doubt that the pendentives found by M. Dieulafoy in Persian buildings were erected in the days of the Achæmenides. This dynasty began in the eighth century B.C., and was so called from a supposed ancestor named Achæmenes, and ended by Alexander the Great's conquest of Darius at Arbela in 331 B.C., or, at least, when Darius was murdered by Bessus (330 B.C.). These palaces with halls domed on a square plan have hitherto been attributed to the Sasanian period. The Sasanian dynasty began at the accession of Artaxerxes I. (Ardshire) in 226 A.D., and was so named from his father Sasan. I should mention that this Persian discovery or practice was not that of the perfect spherical pendentive, but may be called a pendentive partly supported on a squinch. A squinch is a stepped or conical vault, commonly called "bonnet-shaped." Circular domes on a square plan have been found at the Palace of Sarvistan (see lithograph), Ferouz-



Plan of dome, Sarvistan.

abad, and in a pavilion at Ferachbad, places to the south of Susa, or nearer to the Persan Gulf. (See "L'Art Antique de la Perse," by Marcel Dieulafoy, 4to., Paris.) As far as we yet know, the Byzantines were the first who threw aside the squinch, and used the pure spherical triangle as a pendentive, except the architect of that isolated example at Caracalla's baths. So numerous have been the invasions, that it is more curious that so much has remained than that so much has been destroyed. Still, it has rendered it impossible to follow the steps of constructive improvement, for, not to speak of the repeated inroad of Goths, Huns, Vandals, Lombards, Burgundians, and Franks in Europe, and the tide of successive Mussulman invasions, the destruction perpetrated by the hordes of savage Tartars under that monster Tamerlane, was almost enough to have destroyed every vestige of civilisation, for he swept over Asia from beyond the Ganges to Smyrna, and through Syria to the Holy Land, and this destruction only ended at the beginning of the fifteenth century.

You see how slowly great inventions spread: it was, at least, 300 years after its introduction into Europe before any attempt, that we know of, was made to use it on a grand scale. After the discovery of the use of the pendentive at so early a date as the fourth century B.C., it is scarcely necessary to cite examples before the time of Justinian, but the Marquis de Vogüé, in his "Syrie Centrale," gives illustrations of a little chapel, or kabylé, at Omm-es-Zeitoun, in Syria (see lithograph), of the year 285 A.D., which has a dome on a square plan, but this is built on corbelling much after the fashion of the tomb at Mylassa (see lithograph).

In 532 A.D., Justinian began the rebuilding of Constantine's Basilica of Sta. Sophia at Constantinople; this cathedral had been burnt down in a riot between the partisans of the rival charioteers. The colours used by the charioteers in the Roman Circus were white, blue, red, and green, but at Constantinople blue and green, called Venetus and Prasinus, seem only to have been used, the bulk of the people seems to have adopted one or the other of these two colours as a political as well as an ecclesiastical badge. The blues were the partisans of Justinian, the greens of the descendants of Theodosius, and as the blues were in favour of the reigning emperor, and believed in his orthodoxy, they considered that their zeal on his behalf should cover all their crimes and misdemeanours; robbery, murder, and arson were perpetrated by bands of robbers under the blue badge, and mostly with impunity. The father of the Empress Theodora was the Emperor Justin's bear-ward, and when he died, leaving his widow and three daughters penniless, the widow appealed to the "fancy" in the circus to continue the employment to her new husband, and thus to provide for her and her family. This appeal was received by the greens with contempt, by the blues with compassion; and they elected the new husband as their keeper of the beasts. Theodora and her elder sister were brought up as actresses, and her genius led her to be a comic one. After she became Empress she always protected the blues, and persecuted the greens. A riot took place at the conclusion of the games on the Ides of January, 532, and some of the rioters of both colours were executed. Thereupon the two factions joined, elected a new Emperor, and, after having burnt down about half the city, besieged the Emperor in his Palace. Justinian was about to fly, but by the remonstrance of Theodora and his general, Belisarius, he consented to remain, and allowed Belisarius to quell the riot, called the "Nika." Belisarius, Mundus, and Narses forced their way into the hippodrome where the people were crowning the new Emperor Hypatius, and butchered the bulk of them. Thirty thousand people are said to have perished in these riots. Forty days afterwards the site of the new Cathedral had been cleared, and the rebuilding was begun under the directions of two Asiatic Greek architects or mechanicians, Anthemius, of Tralles, and Isodore, of Miletus, from the model of Anthemius. The Cathedral to Sta. Sophia, Holy Wisdom or the Word of God, was completed by ten thousand workmen in about six years, and its cost is estimated at a million pounds sterling.

You see by the plan that the nave consists of a square, over which is the great dome, with semicircular apses at the eastern and western ends of the square.*

On each side of the great apses are two subsidiary apses, and what we should call a "choir," projects from the centre of the eastern apse, but with the Byzantines the nave was the choir, and the choir was the sanctuary or bema. There are aisles on both sides of the cathedral, the middle parts of which form the transepts; these, however, are hidden from view by the screens of columns to the north and south, so that the cross is only apparent from the plan. In front of the cathedral there is a narthex, "the reed," so-called from its narrowness, and an exonarthex. The narthex was used by the Catechumens, or scholars not yet fully initiated into the Holy Faith, and by penitents guilty of backsliding, both of whom were not allowed to enter into the body of the church during the service.

It was a brilliant idea of Anthemius to employ pendentives on so grand a scale, and although the use of pendentives, as we have seen, was not novel, it was so to the unarchitectural contemporaries of Anthemius. Procopius, who had been the secretary of Belisarius, and was afterwards made a Senator and Præfect of Constantinople, has given some account of the building and appearance of Sta. Sophia. Speaking of the centre part, he says:—"As the arches are arranged in a quadrangular figure, the stonework between them takes the shape of a triangle, the lower angle of each triangle being compressed between the shoulders of the arches, is slender, while the upper part becomes wider as it rises in the space between them, and ends against the circle which rises thence, forming there its remaining angles. A spherical-shaped dome standing upon this circle makes it exceedingly beautiful. From the lightness of the building it does not appear to rest upon a solid foundation, but to cover the place beneath as though it were suspended from heaven by the fabled golden chain" ("Procopius of the Buildings of Justinian," Lib. 1).

This splendid discovery in the art of doming is, as I said before, considered by M. de Verneilh to be the distinguishing mark of Byzantine architecture in the west; besides this prime invention, many minor constructive improvements were made. The Corinthian capitals, which in Diocletian's Palace bore the arches directly on them, were no longer fit for carrying great weights when the pier carried by them was as wide or wider than the abacus, as the thin abacus of a Corinthian capital would have broken. A squatter capital was therefore used, mostly of a cup-like shape or a square, bevelled off into a circle, just as you see a pile bevelled to get on the ring. The capitals were not cut into deeply, but were mostly covered with surface ornament of the Byzantine Acanthus or of basket work. There are, however, capitals of the fifth century that have the angles carved in high relief, and old classic caps were used, but mostly with a block over them. We by no means find in Byzantine architecture the artistic perfection of the best period of Greek, nor do we find the majestic dignity of the Augustan period of Roman: the profiles want vigour and style, and the mouldings are also wanting in character and beauty, and too much resemble those used by a cheap marble mason to save labour and material. There is, too, in Byzantine architecture a lack of perception for the finest proportion. Though Procopius pays Sta. Sophia the following left-handed compliment: "It is distinguished by indescribable beauty, for it excels both in its size and in the harmony of its proportion, having no part excessive and none deficient; being more magnificent than ordinary buildings, and much more elegant than those which are out of proportion."

Where ornament is used, it wants that perfection of grace that Greek ornament had, though it is freer and more varied in design, and some of its acanthus-work is effective, elegant, and beautiful. The ornamental parts, however, are too frequently wholly covered with ornament of nearly the same weight. In the interiors of Byzantine buildings the eye is fascinated by the colour, the walls being wholly covered with beautiful marbles, often inlaid in superb patterns, and the domes and vaults with glass mosaic; in short, it was the decoration of the days of imperial Rome, only, instead of the ideal forms of beauty pourtrayed in gods and goddesses, heroes and nymphs, we have "grisly saints and martyrs hairy." Perhaps, too, the judgment is somewhat warped by the lovely materials employed. The outsides of early Byzantine buildings are mostly left to take care of themselves, though an inclination to this method was characteristic of the post-Augustan architecture of Rome, and is a favourite programme for obtaining excellence in the present day.

The later buildings, called by some "Neo-Byzantine," have always high drums to the domes; those that are octagonal and whose window heads cut into the dome are almost hideous outside, and contrast most unfavourably with the plainness of the earlier buildings; but for all this I think we may say that Roman architecture had at last logically advanced to a purely arched and domed construction, and had clothed that construction with a new system of moulding and of ornament, so as to form a distinct architectural style. In the present day, all the architects of Christendom are striving to find out what will take the fancy of the people. Each architect has so far mastered one of the bygone styles as to have rendered it flexible in his hands, so that he can mould the style to the wants and uses of the present day. (We get every past style admirably paraphrased, if we except Greek and the work of the sculptor architects of the early Italian Renaissance.) If the varieties of styles be considered, ranging as they do from prehistoric architecture through the solid marble architecture of Greece, the veneered architecture of Rome and Byzantium, through the Saracenic, Gothic, and Renaissance styles, and

* The drawing exhibited was made for me by Mr. Watt.

† A. Choisy. "Les fouilles de Suse et l'Art Antique de la Perse" (extrait de la Gazette Archéologique de 1887). Paris, 4to, 1887.

* The plan and section of St. Sophia will be given in our next number.

their endless schools, this must be looked on as no small achievement. Still, we have to make the one step forward which will captivate the sense of beauty and æsthetic fitness that we think must be floating in the minds of the public, and thus lay the foundation of a new style, which our successors may improve upon and perfect. We especially want to give to the new materials employed,—particularly to iron, —some vigorous stamp of architectural beauty.

The late Mr. H. H. Richardson, of America, gave a Byzantine air to some of his buildings, and adopted or adapted some Byzantine forms and ornament, and some of you may have heard Professor Babcock's eulogy on the new Byzantine architecture of America.

It is not so much, however, as a style to be paraphrased, as a valuable study to be pursued, that I am drawing your attention to it, though if iron were eliminated there are few bye-gone styles that are so capable of being now used, and are in many respects so satisfactory. Byzantine buildings of the best age look internally stable, grand, and simple, and we are by no means bound to perpetuate the poor mouldings or semi-barbaric figures of Byzantine art; we want architecture, not archæology.

We see that the Byzantine architects and sculptors were full of resources, both constructional and artistic: the dome "pendent by subtile magic" on its four pendentives was a prime invention; I say invention, because, though it may have been known for centuries, no one had before dared to use it on a grand scale. We say wrought-iron girders are an invention of the nineteenth century, though they were used in the third century at Caracalla's Baths,—heavy abutments had to be provided to resist the thrust of pendentives, domes, and semi-domes. Many of the curious flat apses with which Byzantine architecture abound were made to that end, though flat apses had been used very much earlier. All sorts of ingenious devices were used to save centering and its shoring, as I shall show you, and when the capitals of columns were required to be large and heavy to support immense superstructures, new forms and new adaptations of ornament had to be used.

Mr. Ruskin and Mr. W. Morris have both been eloquent on Byzantine Architecture; the latter went so far as to say publicly that the interior of St. Sophia was, in his opinion, the most beautiful in the world; and Professor Lewis, in his preface to Procopius' Buildings of Justinian, says:—"Earthquakes and faults of construction occasioned the rebuilding of the great dome, but it still crowns, after a trial of more than 1,300 years, one of the most beautiful buildings in existence." I shall tell you what I think of it hereafter.

There is no recipe for invention, it is a gift; but when the elements of architecture have been learnt, there seems to me no better exercise as a preliminary to invention than studying how former architects adapted old forms to new wants, how they solved the new problems of construction that were forced upon them, and how they artistically treated those new forms, so as to bring them within the pale of architecture; nor a better study for sculptors than how to adapt the old ornament to the new forms, until they can invent new ornament for them.

Greek architecture was purely an artistic invention—the constructive principle was that of Egypt and Stonehenge. The Romans seem at first to have copied, as well as they could, the debased Greek architecture of their day, to have introduced such alterations as would make every part conform to a general rule, and to alter the æsthetic part so as to make it more in accordance with their coarse taste and love of magnificence. After a time the arch was found to be too convenient to be disregarded, and gradually superseded its older and more dignified rival, the lintel. As soon as vaulting came into general use the thrusts had to be counteracted, for even supposing that the vaults when set had no thrust, this was not the case when they were green.

You can see how the halls or compartments, in large vaulted buildings such as the baths, were arranged, so as to act as counterpoises to one another. When groined vaults were adopted, projecting piers were brought out at the angles of each chamber and plain arches sprang from them next the walls, so as to provide abutments for the diagonal thrusts of the groins; where groined vaults were used in an apartment higher than the rest, the lower part of the wall was abutted by deep walls and by vaulted recesses, but above these, where the outer walls were comparatively thin, buttresses were used, as in the case of the tepidaria of all the baths and the nave of the basilica of Maxentius. In the west, before the emergence of the Byzantine style, the half-domes of apses were abutted by enclosing them in solid half-squares, the angles of which acted as buttresses.

The walls of circular-domed structures were either of enormous thickness, or else the structures were made square outside to get abutments at the angles. We see no signs of any great organic advance in construction, after the invention of groined vaults, until we come to the Baths of Constantine, where the groined vaults of the building in front of the Laconicum are abutted by shallow apses without solid angles. We know too that as these great tepidaria of the baths wanted lofty arches to the recesses both for effect and light, the entablatures between the columns were consequently dispensed with, and the columns were merely shores with a strip of entablature above them to help support the groins of the vault. I say help, because the entablatures then became lintels. When the architect of Caracalla's Baths wanted to make his celebrated solar cell, *i.e.*, a covered swimming bath lit from above, he could not vault it, or he would have blocked out the light from the tepidarium, so he hit upon the original scheme of carrying the flat roof and ceiling by means of wrought-iron girders, forestalling the modern English invention by some 1600 years.

It is possible that at some future time, churches and cathedrals may be wanted whose plan and arrangements are adapted to the Protestant ritual. In the Byzantine churches we have every sort of plan that can well be imagined, circular, octagonal, square, trefoil, quaterfoil, cruciform, of many varieties, and of that form which the Byzantines called "in the shape of a circus," but which we call "in the form of a basilica," and these Byzantine churches might give hints for what is wanted for a true Protestant church or cathedral. Two storyed museums, picture and sculpture galleries may some day be wanted to show the works exhibited in their lower rooms instead of concealing them, and many Byzantine devices might give us hints how to do this.

The Byzantine churches were constructed of all sorts of materials. The walls mostly of stone, with a course of bricks between each stone, and the vaults and domes of burnt brick, and roofed in all sorts of ways from the common truss of perishable and inflammable wood to the permanent vault or dome. In Syria another form of roofing was used, *i.e.*, vast slabs of stone were supported on arches and formed the ceiling, and supported the rubble terraces that acted as roofs.

If we owed that Bulgarian peasant, Oupravda —afterwards called Justinian—a debt of gratitude for nothing else, we owe it to him for having Sta. Sophia built without wood, as well as for the excellent construction of the fortifications of the Castle of Edessa on the Euphrates, which have lasted to the present day. We, who are Londoners living in a brick district, naturally take the greatest interest in vaults and domes of brick, as we have the materials at hand without the expense of carriage from a distance, besides being more familiar with brick construction, not to speak of brickwork having a flavour of the locality. Vaults and domes naturally took their rise in treeless countries. The old proverb says, "Necessity is the mother of invention," and where good timber was not to be had, some other means of covering had to be devised.

We see how the people of Persia and Mesopotamia contrived to cover their buildings with vaults and domes almost without centering, from having no other means of roofing. Strabo (Lib. 16, c. 1, p. 5), speaking of Babylon, says: "Whence among the seven wonders of the world are reckoned this wall and the hanging gardens. . . . the garden consists of vaulted terraces, raised one above another, and resting upon cube-shaped pillars. . . . The pillars, the vaults, and the terraces are constructed of baked brick and asphalte," and, in speaking of the city, he says: "All the houses are vaulted on account of the want of timber. For the country is bare, a great part of it is covered with shrubs, and produces nothing but the palm."

Now and then in London we see a vaulted Church or a vaulted hall, but the greater part of our buildings are only walls with a wooden roof; even St. Paul's would present us with the lantern on a limekiln if the wooden dome were burnt, and the fall of the timber did not bring down the cone. Ware says "It is the roof that makes the house," and it is pitiable to think that a fire would reduce nearly all our great buildings to the state of walls, for most of the great vaulted constructions we simulate are built by us of lath and plaster. The great Ahmed-Ibn-Touloun showed his wisdom in forcing his Coptic architect to build his Mosque at Cairo of burnt brick, saying that every other material perished by fire or water. When we recollect what architecture does for a country we ought to insist that our national buildings should be built of burnt brick and vaulted with the same material, so that when our empire has passed away there may be remnants left of our former greatness.

You all know that I am a great advocate for the architectural use of iron, but under the destructive influence of fire iron is even more ruinous to structures than wood itself, and stone and marble calcine, or split to pieces.

The value of the past is in the priceless lessons it can give us for present use. The study of Virgil gave the world the Divina Commedia of Dante, and the study of the written masterpieces of antiquity the present literature of Europe; the study of the fragments of antique sculpture revived the sculptors' art, and gave dignity to painting. Even in the present day, the discovery of the ruins of an ancient civilisation may be fraught with wonderful and unhoped-for results. Look at M. Dieulafoy's discovery of the ruins of the Persian palaces! The magnificent enamelled friezes from the Palaces of Darius and Xerxes, that were found at Susa, have not only enlarged the minds of every visitor to the Louvre, have given an almost unique lesson in monumental colouring, but have also given a fresh impetus to that beautiful branch of art, enamelled pottery. All of the roofs of last year's Exhibition building at Paris were resplendent with colour, wholly due to the exhibition of those enamelled friezes. I do not grudge our gifted neighbours these well-earned trophies, of which they have made so excellent a use, but we cannot forget that it was the parsimony of our Government that prevented us from having them. Loftus began the excavations in that very mound some thirty-five years ago, and had to relinquish them for want of funds.

I will, however, return to my subject, and try and whet your appetites for learning more about Byzantine architecture. Though the Byzantines had become Christians, they by no means eschewed those sins which are denounced under the names of the "lust of the eye" and the "pride of life." When these sins were indulged in for ecclesiastical buildings, furniture, and dresses, they were supposed to be peculiarly favoured by Heaven. Procopius tells us that Justinian having ordered a church to be built at Jerusalem, in honour of the Virgin, required it to be "surrounded on every side with columns such as in beauty would be worthy of the main building, and of a size capable of supporting the weight that would be laid upon them," but from the precipitious character of the place such columns could not be brought there. He goes on to say that "while, however, the Emperor was grieving at this difficulty, God pointed out, for this purpose, in the nearest mountains a bed of stone of a kind suitable for this purpose, which either had existed there in former times, and been concealed, or was then created. Either story is credible." And he tells us that these columns were "of a colour that resembles flame." In addition to this new marble every splendid marble that had adorned ancient temples not only in Rome, but in all the Roman provinces, had been stripped from them, and conveyed to Constantinople to enrich the churches; glass mosaic was manufactured there; gold and silver, precious gems, and costly stuffs were given to the churches in profusion, and as the silkworm had been introduced into Constantinople there was no lack of silk. Procopius says in the Sanctuary of Santa Sophia alone there were 40,000 lbs. weight of silver, of which the iconostasis and furniture were composed. And Paul the Silentiary says: "In the circular part under the great dome was the Ambo, which was built of the rarest marbles, enriched with precious stones and ornaments in enamelled gold. This tribune, big enough for the consecration of the Emperors, was crowned with a dome covered with plates of gold enriched with gems; a great cross, ornamented with rubies and whole pearls, completed the decoration."

I think I have already said enough about Byzantine architecture to interest you in it, but I will say a few words more about Byzantium and the Byzantine Empire. Though architecture is our study, we cannot be altogether indifferent to those other fine arts which so greatly add to its beauty and interest; we must have some feeling of respect for the centre of an empire which was so long a bulwark against barbarism, and for that seat of art and learning from which cultivation was obtained: we can hardly expect architecture to be desired and appreciated by people who are wholly destitute of any feeling for the fine arts. Byzantium itself was a centre of all the arts, and though they did not flourish there as perfectly as at Athens in the days of Pericles, nor even as they did at Rome in the days of Augustus, yet the fine arts to a certain extent were there when they were extinct in the West. At Byzantium the traditions of antiquity were at least kept up, and in this way it was able to sow elsewhere the seed of artistic regeneration.

Byzantium supplied twelve thousand artisans for the construction of Walid the First's Mosque at Damascus between 708 and 718 A.D., and supplied him as well with the mosaic; it furnished architects and artificers to Charlemagne (771-814), and to Abd-el-Rahman the First at Cordova (755-787). Subsequently it sent architects to design and superintend the building of St. Mark's at Venice, and probably these same architects built St. Front, at Perigueux, and to its arts we mainly owe the Cathedral of St. Trophime, at Arles, and St. Gilles.

It was for many centuries a barrier against the devastation of the savages, and a bulwark against Mohammedan invasion, until it was left to its fate by the European nations through theological hatred. To the learned men it still cherished, to the codices of the ancient writers it preserved, and to the engraved gems, the basreliefs, and the statues it cherished, we mainly owe the great Renaissance of the fifteenth century, from which we are still reaping the benefits, and from the escape of its scholars before its last throes we owe the knowledge and study of Greek throughout Christendom.

THE ARCHITECTURAL ASSOCIATION:

WOOD AND STONE CARVING.

THE usual fortnightly meeting of this Association was held on Friday, the 23rd inst., in the meeting-room of the Royal Institute of British Architects, Mr. F. T. Baggallay, Vice-President, in the chair.

The following gentlemen were elected members,—viz., Messrs. E. R. Hudson, F. Foster, P. Hamilton, and C. F. Mitchell.

Three papers on "Wood and stone carving" were then read by Messrs. T. Stirling Lee, F. W. Pomeroy, and W. S. Frith.

Mr. Stirling Lee's Paper.

On receiving your kind invitation to read a paper before you on stone and wood carving, I felt it not only a great compliment but a source of gratification as a sign that the representatives of the arts of architecture and sculpture were growing more and more brotherly in their association, the result of which intercourse was already having very great beneficial results, and bids fair to place us on a road that will ultimately, I trust, create an art epoch in history.

I think no subject can be of greater mutual interest than the one chosen by you for discussion this evening, "Stone and Woodcarving." Certainly none is more occupying the minds of sculptors at the present time than this, the glyphic portion of our art, for it is that part of our art that schools and academies cannot teach and can only be acquired by practical experience, without which knowledge a man cannot rightly be called sculptor (or stone cutter). The divorcement of sculpture from architecture in England for many ages is, no doubt, responsible for so many of our sculptors devoting themselves almost entirely to the pastic portion of our art, for on looking at the buildings erected during the last generation (many of them public buildings) we cannot blind ourselves to the fact that the carving upon them is of the poorest and cheapest character, with the result, I think, we have all come to the conclusion that it is far wiser and more beautiful to keep to the simple grandeur of masonry than cover with meritricious meaningless carving at so much the foot-run. Let us think for an instant how all architectural periods have developed; how from simple blocks and masoned mouldings into carved capitals, friezes, figured pediments, and niches, and we recognise that it was the desire of thinking man to illustrate his thoughts in symbolic and figurative language, often the architect or head mason devoting his time to this carving, and decadence setting in on the desire for such enrichment without reason. No art demands to be more controlled by stern logic than that of sculpture. The very fact that it calls into play the faculty of imagination is sufficient cause that one should never forget the science that controls our materials. It was the neglect or ignorance of the limitations of their material that brought home to the French how far they had gone wrong and how meretricious their dancing exaggerated strain after movement was when executed in stone as architectural decoration.

I have already mentioned that carving must be controlled by scientific laws, that all stone enrichments must be geometrical, as the human form must, of necessity, have its anatomical construction correct. This fact brings home to us that carved work is but the highest form of masonry, enrichment by light and shade and balance of parts, all starting and contained within plains, beginning with its plain of work, and its depth governed by the amount of shade necessary to carry and keep it harmonious with the surrounding mouldings, in other words, to use a modern expression, to be correct in colour.

The Greeks worked so geometrically that they had set forms for different characters of figures, and the process of working is clearly shown by some blocks still lying at the marble quarries of Paria. The sculptor had sent a drawing of his work in planes. These were worked at the quarries to facilitate the raising and removing of the block, and also enabled one to judge of the quality of the marble, the name of which Lychnitie (light) gives the account of the way in which the quarry was worked by lamps; the geometrical methods of working stone explains why the Greeks had one word for mason and carver, λιθουργός, and how often the mason rose to be a figure sculptor, and it comes clearly home to all carvers how necessary is the ground-work of a knowledge of masonry. The more he knows, the greater his experience, the greater amount of knowledge will he put into his geometrical forms.

Let us now consider upon what lines the carver proceeds to enrich these forms. We have stated that his work must be in keeping, in style, and in harmony with the light and shade effect of the surrounding mouldings. It is the effect of things that is revealed to us through the eye, not lines only, but the result of lines with light and shade. To impress pleasant and grand effects it is necessary to obtain that result by treatment of light and shade. How beautiful and subtle is this study of light and shade in carving and full of interest, for by it we can read and understand the climate and atmosphere of countries. As atmosphere governs the effects of objects, so we understand the different treatments varying in character according to the aspect in which the work was situated. So proportions, mouldings, carving designed for Egypt, Greece, Italy, become unsuitable for slavish copying in England, and poor London. And how wrong one may go in working away from without studying the ultimate position of your work *in situ*. You will understand me to mean that all carving should be executed *in situ*, and whenever possible I certainly advise one doing so. When not practicable, as may often be the case, for instance, when the figure is introduced, and the study of drapery, it is as well to make a shade drawing on the spot with the principal lines, carving in the lines of the building, then make a sketch with the surrounding moulding in plaster, colour the whole with clay water, executing the work as far as possible in the light in which the work will ultimately be placed. Let us take for example a reredos or altar: it cannot be modelled or carved *in situ*, yet what requires more study? Often the only window by which it is lighted is one behind and above the work; execute it by the ordinary studio light, when placed, the whole work may become a nothing. I may mention one instance in which this was the case, nothing of the carving could be seen, so that the background had to be cut away, and a different-coloured marble inserted, to make the figures stand out by contrast of colour. Yet the law which governs relief is, the deeper the shade the lower the necessary relief, and the stronger the light the higher and bolder the work, so that when you have a sunny, southern aspect, sunlight playing into your shadows, your work will only tell by undercutting. I trust that I have made myself clear in showing how essential and how great a part the study of light and shade becomes as well as flow of line.

I wish to say a few words here on quality, or what is generally understood by tone. This depends entirely on the cutting of your material. I do not think that I can illustrate it better than by colour. Take an isolated pigment—it is crude, and it is by the painter's faculty for colour will his work be rich and full in tone or quality, so it is with stone, its rich fulness of colour depends entirely on the carver. Take a man sniggling at his work, smoothing, rasping, sand-papering, getting what is generally termed a high finish, yet his work is lifeless, toneless, and quite devoid of quality. A good carver knows how necessary it is to cut with as clean a cut as possible, each cut full of perfect knowledge and meaning and complete in its cutting, for by so doing he brings out the richness of local colour of his material and his work more durable by closing the grain to the deleterious effects of atmosphere.

I wish to say a few words on subjects. How often has one been carried off to the museums and some style of by-gone ages pointed to to copy; have we not sources of inspiration and design as all the ages gone before; have we not now animals, birds, fish, flowers, human beings as they had in Greece, Italy, and England in thirteenth and fourteenth centuries; have they not the same symbolic meaning now that they always had; are they not as beautiful as they always were? Let us see nature with our own eyes and tell our own thoughts, and, in a short time, you will have, if the opportunities are given, men as great carvers and thinkers as have ever been; one may say it is a question of cost. In my own experience I know men who have done architectural work at little above the cost, and are as enthusiastic as in the age when men joined brotherhoods to be able to spend their lives carving out the work of love in decorating the churches, opportunities we have seen given to the carving-shops that would have gladdened the hearts of Pheidias, Giotto, or Donatello,—give men the opportunity, and they will raise schools of workmen capable of doing the highest at the same cost as at present and turn your stones into a rich harvest of beauty and thought.

Mr. Pomeroy's Paper.

Nothing is more remarkable in this so-called age of science than to observe the manner in which Art in all its branches has become the fashion in these last years of the nineteenth century. To talk of art, to admire art, to write about art, sometimes with knowledge, how often without! To practice it as an amateur, and sometimes to purchase its products, is, in the present day, to be very decidedly in the fashion. That art should have in this way so seized upon the popular taste, for a moment, possibly, let us hope permanently, is a sure and direct testimony to the fresh energy and vitality which is being displayed in all its branches. In strife there is life, and out of the multitude of cliques and ideas, from the struggles of schools after independence and originality, there results a genuine enthusiasm, which, often misdirected, yet occasionally tends to the production of works of real excellence.

This vitality of art, which by its many-sidedness, has conquered the bulwarks of fashion, is not found in any less degree in the sculpture of our day. It is the custom nowadays to speak and write of the new English school of sculpture, as a discovery of the moment. So in a measure it is; but even in this young school there are sects and divisions. The conventional sculpture of the beginning of the century, with its pseudo-clsssicism, its insipid beauty, and its false idealism, is rapidly becoming a thing of the past. In its stead we have springing up around us two or three more or less distinct classes of students in sculpture. There is the student who has learnt only to model in art schools, and whose mind does not soar beyond the perpetration of a portrait bust, simply because he has had no training in the realities of his craft. Then, of course, as in painting, so in sculpture, we must have our impressionists, the seekers after originality, rushing to the opposite extreme from rules and conventions, rejoicing in mud-sketches devoid of form, full of sug-

gestiveness, perchance, but absolutely lacking the first essentials of good carving,—beauty of outline and drawing. Forgetful they would seem to be of the fact that, whether their material be clay, marble, or bronze, complete incompleteness can only be true, if after the manner of some of Michelangelo's works it consists, not so much in blurred lines but in the suggestiveness of masses, cut with severity and strength, and chiselled or modelled, if only in a sketchy manner, yet with absolute truth to rudimentary form. Last, and, perhaps, most important of all are the body of carver modeller's men who have received a thorough *craftsman's* training, who acknowledge the leadership of such men as Armstead, Thornycroft, Gilbert, and Ford, and the vitality of their principles, as received from the great masters of the past. These are the men who recognise that sculptors' work is bound up with that of the architect, and that in the future it is in the highest degree desirable that he, the architect, should endeavour to carefully select his sculptor and give him a fairly free hand in carrying out his work.

That the views of these men, which are indeed my own, with regard to the relations of sculpture and architecture, will be proved right by the work of the future, I feel assured; and I am all the more certain of this when I look back on the history of art, and see the close connexion between the two branches in the past. Neither space nor time will allow me here to sketch out, in evolutionary order, a history of decorative sculpture, but with all due honour to the antecedent glories of Egypt and Assyria, I should like here to touch slightly on the three great schools of the Greek, the Gothic, and the Renaissance, to note their characteristics, their independence of thought, their grasp of their material, and the close connexion between designer and decorator, between architect and sculptor, both of whom must have been artists, not mere workmen.

First, then, with regard to the Greeks, what where the conditions under which these artists in stone spent their artistic life? Dwellers in a beautiful climate, in a land of sunshine and blue sky. Worshippers in temples from the very simplicity of their construction eminently adapted for simple and beautiful decoration; for them, perhaps, it was easy to reach the high ideal. To them religion offered no intellectual problems; to live was to worship. The beauty of life, the beauty of existence, the ideal of beauty, the perfect human form, they had but to execute in stone that which they saw around them. To this work their artistic genius brought full aid. With ease and consummate mastery do their craftsmen conventionalise with a beautiful truth the simplest forms of nature. In their hands vegetable forms are for the first time rewoven into lovely and endless designs, and the human form, always beautiful, ever dignified, is placed in its right niche, takes its right position, on pediment, or frieze, with a knowledge of the due relations of the light and shade, of the structure and its decoration, which evolved, as it may be, from the Eastern nations, and, transmitted from one craftsman to another, seems in its completeness little short of heaven-born.

With Gothic sculpture a change has already passed over the world. Intellectual and religious problems are beginning to get hold of the artists. Religion and art are no longer one in simple worship of beauty, and the Deity expressed in beautiful existence. Art is now the servant of religion, that religion of Christianity in which mercy is greater than justice, but in which the blindness of man has made justice and judgment outway mercy. With what result? The fear of judgment has produced superstition, and superstition has enslaved art. The artist dwellers in Northern and rude climes, are haunted with visions of the devil; to them the unknown and the terrible speak of the powers of evil. Possessed with this fear, anxious to propitiate, the craftsmen with their infinite and intricate skill, fellow-workers of the architect, turned their great gifts, now to the grotesque, now to the hideous in stone, now to the stories of Christianity, with a fidelity in which truth comes before beauty; and now to the foliage forms of nature with a skill and an invention which have given us the most varied and exquisite designs, and have immortalised the stone-carvers of the Gothic arts as artists of ability, equalled only by the genins of those architects under whose liberal supervision they worked.

In England, it is interesting to note that while Nicholas da Pisano was working out the revival of ornamental decoration in Italy, our own craftsmen were winning for themselves a high place in contemporary art. As a specimen of our English gothic, Wells cathedral, built by Bishop Jocelyn, will compare favourably with larger structures in the beauty and exquisite character of its carvings. With regard to it, Flaxman says, "There are many creations of the Almighty creating Eve, but this is certainly the oldest, and is not inferior to the others; in parts there is a beautiful simplicity, sometimes a grace excelling more modern productions." That it was executed by Englishmen there is little doubt, and it is curious to observe that the cathedral possessing such beautiful works, was finished in 1252, the year Cimabue, the reviver of painting in Italy was born, thirty-six years before the cathedral of Orvieto was begun, and forty-six years before that of Amiens in France.

In France Gothic art flourished with its greatest strength,—this probably owing to the protracted Roman occupation, and the consequent continued importation of Greek and Roman artists into the country, who started an artistic tradition of sculpture, and the native mind became saturated with the carver's art. A magnificent crop of Gothic art, culminating in Rheims Cathedral was the immediate result; but the consequences were more far-reaching. The roots struck deep in the people's life, and France has ever since remained, with her traditions and her examples, the happy land of sculptors to the manner bore in age succeeding age. The traditions of the old artist carvers, who wrought with consummate skill on portal, on altars, on tombs and tabernacles, have been handed down from generation to generation. The muster-roll of famous names extends from Germain Pilou, Jean Joujou to Rude, Barrias, Dubois, Rodin, and many others, whose works have placed La Belle France at the head of artistic nations at the present day.

In Italy, except the northern part, the Gothic had never a firm footing, the influence of the Græco-Roman always being in the ascendant. Nicholas da Pisano, the first sculptor of eminence, undoubtedly was inspired from old fragments of Roman urns and bases that abounded in the country.

But it is in Italy that the third great school of sculpture which I wish to mention, "the Renaissance," reached its fullest glory, stamped its mark upon the world, and has in modern art a greater influence than either of the before-mentioned schools.

By this time thought was emancipated, the sculptor free from the fetters of superstition, and conscious of something more than the religion of beauty, strove to add to his work ideas of character, of mind, of individuality of his subject, in addition to the charm of beauty. His mind sought to produce in his material ideas not only of beauty of appearance but of beautiful thoughts, true types of character, earnest definition of mental qualities, yet with due reference to the right methods of artistic conventionality.

At the same time he learned to give that true appearance of form, its charms and dignity, and likewise to preserve the thousand accidental graces of real human beings. Not only in their ideas did these artists excel, but also especially in their technical excellence; and in their treatment of low relief they have achieved their greatest triumphs; they realised that in a good low relief the head must often project more than the other parts for the sake of effect. In their works, parts are flattened and nearly obliterated to reduce light and shade, and give effect of distance; little trenches or grooves are cut into the background where greater definition is desired; in short, the work becomes like the painters, an effect of light and shade; and the greater subtleties exercised the more charming the effect.

And the lessons which they discovered for themselves, in low relief, the Renaissance carvers carried into their works in the round. No rude effects of black and white, but a delicate harmony of tones—nothing quite made out, the hollows not quite so deep, the projections not quite so high. Among the casts at South Kensington Museum beautiful examples of their art may be seen. Thus, in the statue of St. John the Baptist, from Siena, by Donatello, the arms and some parts of the drapery are flattened quite in the manner of a relief; but this paleness of treatment (if I may use the term) is not allowed to be an excuse for slovenliness or want of power in drawing; there is no lack of finish, everything is wrought out with loving care, and cut to the highest perfection.

Mino da Fiesole, Donatello, Verrochio, Settignano, and others, whose very names call up sweet visions of grace and beauty, were all architectural sculptors in the true sense of the word.

My object in drawing attention to these three schools of sculpture, whose artists are the models of our great workers of to-day, has been to show that nearly all the work was intimately connected with architecture, and if we are to have a School of Sculpture there must be no foolish distinctions. We must understand the limitations and the extent of our material, the application of design to given spaces, the effect of work seen from a distance, and that systematic labour, and "infinite capacity for taking pains that is only to be acquired in early youth."

Mr. J. D. Sedding, in his charming paper on Embroidery, in the Arts and Crafts Catalogue of last year, has struck the right chord when he speaks of the poverty of the designs, and it applies both to embroidery and to carving; but we are weak because we are so trammelled by the reverence that architects have for the archæological side of their profession. How can they expect to get good designers when, if we attempt some new version, we are confronted with the everlasting word *style;* some bit of old work is promptly quoted or shown to us, and if our inventions do not correspond in every particular, we are told that it is much safer and better to copy the old models than originate new designs. Consequently, the carver who wishes to live long and see good days chokes his imagination (if he has any), and becomes nothing but a copying clerk in stone.

This is the reason of the chilly monotony that runs through modern foliage ornament, and it is anything but cheering to find, year after year, presented to our eyes, compositions from which the true spring and ever-varying detail of nature is conspicuously absent. Mr. William Morris is one of the few designers who, with a laudable independence, has dared, and successfully so, to strike out new departures in design.

All art must be seen through the temperament of the artist, whether he be architect or decorator, and if he is one naturally gifted with some special aptitude, he perceives the germs of beauty that exists in the external world, and by his creative power gives new life to the idea in the material which he uses; in short, he thinks in his material.

The most complete training in the theory of art will not enable a person to produce much; but the influence of a cultivated mind is always seen and felt, and the architect who takes the time and trouble thoroughly to supervise all his details, creates that interest and spirit of enthusiasm in the craftsmen, that is necessary for the production of all good art work. Let us throw off the shackles of half-dead conventionalism; for now we only conventionalise on the conventional, and let us spend some of our time in studying the many beautiful trees and plants that abound in our country, bringing all our attention to bear on them, as the sculptor does when he turns his attention to the human figure, making careful studies of selected portions. So that we may be real without being realistic, for realism is not design, and we shall learn more of the true nature of folial ornament in one short summer than by years of laborious copying from old casts.

Mr. Frith's Paper.

By wood and stone carving I understand that part of sculpture usually employed in conjunction with architecture, and which practically all architecture uses as one of the means by which its effect is obtained.

Why carving has received this universal and continuous sanction is a matter of considerable interest to both architects and sculptors; for in this, these arts are most intimately in contact, and the interlacing of one with the other is practised. Wherever architecture in any form exists there also is found its attendant carving. As the reasons for this are most probably appertaining to architecture, it is no doubt becoming in the sculptor to approach the question with proper modesty.

I think it does not affect the building side of architecture, but the æsthetic,—that which deals with the growth of one part from another, and the placing together of harmonious forms. And

it thus groups with the design the arrangement of mouldings and those parts of architecture which, while being unnecessary for purposes connected with stability, are yet required to gratify the eye and mind by satisfying an aspiration for reasonable and beautiful structure and form,—which is as well founded a requirement for the æsthetic comfort as conformity with the laws of gravitation is for the physical.

Taking the instance of the capital, the requirement is not so much from the building point of view; but the form and treatment this feature receives is rather due to the endeavour to give at this point the emphasis felt to be required, while at the same time showing a pleasant growth of one part into the other.

Carving is a part of the general scheme of proportion, form, light and shade of the building, which being carried on through the scheme of mouldings, is emphasised and punctuated by the carving: the same faculties are called into play in each, and knowledge in one can no doubt be readily applied to the other; the distinction is that while mouldings give straight or continuous lines or curves, carving gives broken masses of light and shade and patches of texture, and gives interest to required parts, and that while mouldings mainly consist of the working-out of prescribed curves and surfaces, carving invites the treatment of form of a freer nature. It has also the advantage of the appearance of the thought and its expression being presented together, and in the drift of the tool presenting a charm as showing actual cuts expressive of active thought guiding their production. By giving an approach to the representation of nature, it catches the eye and rivets the attention in a manner that form other than that suggestive of natural objects does not.

The possession of this means of effect, in addition to form more or less geometrical, provides, it may be said, a fuller palette to the artist than mere geometry or masonry would supply, and assists him in that grouping, connecting, and accentuating of effects which is necessary in all art, and which brings about that singing together of parts which we call harmony. It provides the architect with a variety of forms graduating from those little different to masonry to those in which form may be treated in the freest manner that nature or art can sanction.

Where carving shall be rigid, where less retrained, and where freedom can be given, and to what degree, is the essential artistic question; but who shall prescribe in this matter? To lay down laws in art is no doubt useful to students, but the artist usually forgets them.

With reference to this receiving sufficient consideration, I think very much greater attention should be given to it than is now the rule, and that so essential a matter in design might receive a more distinguished place than it at present holds. The ornaments that have been used for the last few centuries might have a rest, and some attempt at real design be made; it is no doubt best to keep to those things which have been proved successful in the past until we get something at least equal in the present; but, while waiting for this, we continue to carve prescribed forms, and the question of original design is neglected.

The mine from which previous motives for design have been drawn is surely open yet; and the wealth of nature not yet exhausted. In, however, our studies from nature, it has to be remembered that a purely imitative, realistic representation carries the mind of the observer through the imitation to the object represented. With a photograph, for instance, the attention is given to the person or scene presented, the photo, if good, escaping attention. In carving, however, we do not wish the conception to be entirely of the object represented, but rather for the attention to be held awhile by the building. This supplies one reason for conventional treatment; another consists in the fact that natural forms like leaves and flowers, which bear small lights and shadows and thin edges, require considerable treatment to make them seem in any way to belong to the building. And some ages have concurred in thinking they should be in some degree (certainly various degrees) conventionalised. I am not at all sure whether, in this respect, the Assyrian reliefs, in the suggestions of treatment they offer, are not in parts superior to the Parthenon frieze. Of course the position occupied and function performed by the carving has much to do with this matter, and for some positions or purposes absolutely realistic work may be best, though this, I think, occurs very rarely.

One important rule in the application of carving is, that when completed the architectural features around shall have increased in value. I recall an instance of a man who designed and carved, and beautifully carved (as far as cutting most difficult stone goes) some ribbons and flowers over a door, with the result that you could not look at the doorway, because of the little black holes in the carving which dazzled the eyes. This was owing to lack of knowledge in light and shade; if the black holes gave greater contrast, and in sum an effect overpowering that afforded by the grey shadow and the light on the mouldings, the carving must start forward and the general effect be injuriously disturbed.

With reference to wood-carving, the adaptability of the material has, I am afraid, led to the loss of much of its distinctive character, which in the hands of an artist would be capable of wise and fruitful use. Anything can be carved in wood; which is probably the earliest material used for sculpture. The questions however arise whether works having great thought and labour expended in their production should be rendered in a material so easily destroyed; whether works depending for their effect upon subtle gradations of light and shade are suitable for this material; and whether the basis for wood-carving should be the imitation of stone or marble work. The wood-carving of the Perpendicular period occurs to me as being suggestive of the direction in which much could be accomplished in design. The simplicity of the means by which beautiful effects can be obtained, the great variety and the freedom with which these effects can be rendered, and the perfect display of the silky surface of the wood, commend this treatment very strongly. The Indian wood-carving also is worth attention, from the way in which the rich colour of the wood is used as an important factor in the design. That wood-carving which aims at the production of form alone, as it necessarily ignores the material, is probably best considered as wood-sculpture, and would thus conform to the general rules governing sculpture, whether in wood, stone, bronze, or marble. In every case the study of light and shade, of the beauty, variety, and fitness of form for the purpose to be fulfilled, together with a knowledge of the qualities of the materials in which these are to be rendered, are the operating means by which the full value of the contribution obtainable from carving can be realised, for the performance of its office of completing and giving point to the effects of the beautiful art of architecture.

Mr. T. E. Pryce, in proposing a vote of thanks to the readers of the three papers, said the subject which had been treated that evening was one which strongly appealed to all architects who had had anything to do with getting carving done. It was not until they came to superintend pieces of carving that they really discovered the extreme difficulty there was in finding a man able to do the work. The longer they worked the greater difficulty they found in carrying out a building that, while satisfying the eye in its proportions, was satisfactory in its smaller details, as a building properly decorated, with really good and artistic carving, did. It had always struck him that the carving in a building, particularly a large building, was a sort of gem enclosed in a setting. First of all, a building was a thing that should be pleasing in its proportions; the mouldings should be graceful, and the plan and elevation and everything in connexion with it should be pleasing to the eye. In looking at the inside of an old building, one was first struck with the general view; but, on looking at it in detail, one was often struck with the beauty, or want of beauty, in the carving that decorated naves or other portions of a building to which the carving might be applied. It always seemed to him, putting on one side figure sculpture, that the reason for the existence of carving in a building was that it should form the beautiful touches that gave life to the whole. With regard to the papers which had been read that evening, he agreed with almost everything that had been said upon the subject of carving, but with regard to what Mr. Pomeroy had said about art being in "the fashion," he (Mr. Pryce) sincerely hoped that, like other fashions, it would not die out in the course of a generation. With regard to what he understood Mr. Pomeroy to say as to the carver's art and the builder's art being trammelled with superstitions during the Middle Ages, he did not think that statement was quite correct. It had always seemed to him that the carver and painter of the Middle Ages was very often really a free-thinker. He could not say much by word of mouth, but he could with brush and chisel. With regard to the wood-carving of the Perpendicular period, he did not think anyone could fail to be struck how truly the carvers of that period realised the capabilities of their materials. With regard to the future of carving, he sincerely hoped that a school of carvers would spring up, untrammelled by the examples of the past. He thought everyone would most gladly welcome the arrival of such a school.

Mr. H. O. Cresswell, in seconding the motion, said he thought it was a matter for congratulation that they had been able to induce three gentlemen like the readers of the papers to come down and give them the benefit of their advice and experience with regard to carving. He hoped that architects would be able to meet sculptors, painters, and other art craftsmen for the discussion of such subjects more frequently than had hitherto been the case. One great difficulty with regard to the use of carving, especially externally and in such smoky cities as London, was that before the carving had been very long executed, its effect was seriously interfered with by the accumulation of soot and dirt. How far carved panels, &c., might be sheltered by projecting mouldings or strings he did not know. Of course, they all admired those very beautiful examples of Donatello and other great masters of the Italian school to which reference had been made, and he thought they all agreed that sculpture, when applied to architecture, was generally most successful when it was formal and not too free.

Mr. F. R. Farrow said he had very great pleasure in supporting the vote of thanks. He thought that the three papers which had been read were amongst the most profitable and useful that had ever been read before the Association. Anything that would tend to bring about an improvement upon the class of work turned out by their old friend the average "architectural carver" was to be warmly welcomed. He agreed with Mr. Pryce in hoping that the present feeling in favour of art would not be a mere fleeting fashion, and that we should no longer go back to archæological precedent for everything that we did. Good work could only be secured by leaving something to the imagination of the artist who executed it. We had had several archæological revivals in the modern history of architecture, but they had all died out, simply because they had been merely archæological and the work of *dilettanti*, who had been content with copying what other men had done. He cordially endorsed the views of Mr. Frith with regard to the wood-carving of the Perpendicular period, and he could not help contrasting that work with the very different class of work which was so much admired by the general public,—he meant the work of Grinling Gibbons and his school. To his mind the work of Grinling Gibbons, marvellous as it was in *technique*, was base in art; indeed, he did not think there was anything worse in art than the carving of Grinling Gibbons. Having made reference to a paper read some years ago before the Association by Mr. Redfern, which, he said, was well worth reading, Mr. Farrow said in conclusion that much good would result to the sculptural decoration of our buildings by more frequent consultation between the architect and the sculptor.

Mr. Brodie also supported the motion, and said he agreed in thinking that one of the most promising signs of the future of architecture was the growing intercourse that was taking place between architects and craftsmen. He instanced the work of Mr. Collcutt as exhibiting ornament profitably applied to architecture. In conclusion, he expressed the hope that not only would architects show an increasing desire to leave the execution of their sculptural decoration to the sculptor, but that the sculptor himself would descend from his high pedestal, and instead of being content with producing busts which were of no interest, would don the blouse and execute the sculptural work of our buildings.

Mr. Moore having said a few words, in the course of which he was very sarcastic as to a

certain class of architectural carvers known as "field-rangers,"

The Chairman in putting the motion, said he quite endorsed all that had been said as to the advantage of closer intercourse between architects and sculptors. And on the general subject he thought that they were very much indebted to the readers of the papers for their kindness in giving the Association the benefit of their experience.

The vote of thanks having been carried by acclamation,

Messrs. Stirling Lee, Pomeroy, and Frith briefly acknowledged the compliment, and the meeting terminated.

Students' Dinner.—On Tuesday, the 20th inst., a large number of the junior students of the Association dined together at the Piccadilly Restaurant. Mr. Arthur W. Earle, who presided, appealed to the members present to support the Committee of the Association in carrying out the new curriculum of architectural education, expressing his intention of voluntarily subscribing one guinea per annum in lieu of half a guinea. The appeal resulted in a long list of names being handed to the chairman as guinea subscribers for next year; leaving the subscription for future years optional. "The Prosperity of the Association, its new Constitution and Curriculum," was then drunk with enthusiasm. The Chairman was instructed to convey to the President, Hon. Secretaries, Editors of *A. A. Notes*, the Committee, Special Educational Committee, and the professional press, the warmest thanks of the junior members for their successful efforts to increase the educational advantages hitherto offered by the Architectural Association. Mr. Earle announced that as a result of the success attending the Saturday summer visits of the Sketching and Measuring Class for the study of old work in and around London, an excursion for one week for junior members would be arranged this summer to some place of architectural interest, probably in the North of England, when he hoped that satisfactory arrangements might be made to enable members of provincial architectural associations to take part if so inclined. It is proposed to arrange for a second dinner to be held later in the session.

COMPETITIONS.

MUNICIPAL LODGING-HOUSE.—In this important competition, held under the auspices of the London County Council, the award of the assessors (Mr. Waterhouse and Mr. T. Blashill) has been presented. It recommends that "the premiums should be awarded as follows:—To Messrs. Gibson & Russell, 27A, Old Bond-street, 100*l.*; to Messrs. Williams & Hopton, 156, Regent-street, 40*l.*; to Messrs. Chorley & Connon, 15, Park-row, Leeds, 30*l.*; to Mr. T. Locke Worthington, 23, Queen Anne's-gate, Westminster, 30*l.*" The matter will now be brought before the Council for its determination. The drawings are not yet publicly exhibited, but it is expected that they will be arranged in some convenient room for public exhibition in a few days.

NEW WORKHOUSE FOR CAMBERWELL.—We are informed that the Camberwell Guardians, at their last meeting, selected, in a limited competition, the designs of Messrs. Wilson, Son, & Aldwinckle, for the new workhouse at East Dulwich, for 1,000 inmates.

GIRLS' GRAMMAR SCHOOL, BARNET, HERTS.—In a limited competition for these buildings, the scheme submitted by Mr. John Ladds, of London, has been selected, and the plans will be put in hand at once.

SURVEYORSHIPS.

WORTHING.—Mr. Aspinall, Town Surveyor of Stroud, has been appointed Borough Surveyor of Worthing. There were ninety-three applications.

BILSTON.—Mr. W. Green, Surveyor to the Bilston Commissioners, has tendered his resignation.

THE RIDING-SCHOOL, KNIGHTSBRIDGE.—The Duke of Wellington has decided to sell his freehold property, commonly known as the Duke of Wellington's Riding-school, with the stables, coach-house, &c., at Knightsbridge. The premises are numbered 42, Albert-gate, and cover an area of nearly 17,000 ft., having frontages of 84 ft. to the main road, 86 ft. along Hyde Park, and about 126 ft. to Park-place If not previously disposed of, this property will be put up for sale at the Mart on March 17 next.

Illustrations.

THE BEAUCHAMP CHAPEL, WARWICK.

THE Beauchamp Chapel stands on the south side of the chancel of St. Mary's, Warwick, and was commenced in 1443 and consecrated in 1475 as a monumental chapel for Richard Beauchamp, Earl of Warwick. His tomb stands in the centre, and is well-known, with its elaborate workmanship and curious "hearse" over the effigy. The effigy itself is carefully given in Stothard's Monumental Effigies, and the whole monument is given in Blore. The drawings from which these illustrations are taken were submitted in competition for the Institute Silver Medal, and gained for their author, Mr. Harold Brakspear, an "honourable mention."*

DESIGN FOR CONGREGATIONAL CHURCH, WEST KENSINGTON.

THIS design was submitted in a limited competition for the above building, but was not successful, that prepared by Messrs. Cubitt & Brydon being chosen and since carried out.

The general plan of the church was intended to be cruciform, four main piers carrying the the roofs at the intersection. Most of the congregation were to be seated on the ground floor, with an end gallery reached by staircases in the base of tower and corresponding turret.

Behind were vestries and large lecture-hall, whilst beneath was a complete school, with series of class-rooms all round.

The design is by Messrs. Potts, Sulman, & Hennings.

EXAMPLES OF EARLY BYZANTINE ARCHITECTURE.

THE diagrams here given are a portion of the illustrations to Professor Aitchison's first Royal Academy lecture, which is fully reported in another column.

THE EXAMINATION AND REMUNERATION OF MUNICIPAL ENGINEERS.

MR. LEWIS ANGELL, F.R.I.B.A., M.Inst.C.E., in the course of his paper read at last week's meeting of the Incorporated Association of Municipal and County Engineers, referred to in our report of the meeting (p. 69, *ante*), said:—

For a long time the Town Surveyor also combined the functions of the Sanitary Inspector and Medical Officer, so far as such functions were performed. These offices now exist collaterally, each working in its own proper province and in unison. Reference has already been made to the crude and unsatisfactory work of the past, neither the professional status, remuneration, nor treatment being such as to secure or retain efficient service. The development of sanitary principles required competent exponents. A leading object of the founders of our Association was to bring about an improvement in this respect. One of the articles set forth in our incorporation is:—

"The promotion of the professional interests, rights, powers, and privileges of County, Urban, and Rural Engineers, the improvement of their professional status, and the extension and interchange of professional knowledge and practice."

Another of our objects is:—

"The examination of persons in Engineering, Surveying, Building Construction, Sanitary Science and Works, and in Local Government and Sanitary Law."

The question of the qualifications of public officers has been much discussed. The Medical Officer has to prove by examination that he possesses at least a minimum of qualification; and by a parity of reasoning, the Engineer should also be required to prove his capability.

In the matter of examination, our Association has come into some conflict with a junior Association,—the Sanitary Institute,—a body which has done good work in promoting a public interest in sanitation, and whose proper field is education. But we considered it our duty to oppose their action in seeking by Royal Charter the right to examine us. Our Association is strictly professional and official, whereas the Sanitary Institute is a heterogeneous society open to all-comers. We do not object to examination in principle, but we repudiate the claim of such a body as the Sanitary Institute to be our examiners. We claim to know more about these matters than the Sanitary Institute, and if such examinations are to be conducted by a private society, we claim to be the better examiners. It will be said that we claim to examine ourselves. We reply that our examinations were established as a protest against the Sanitary Institute usurping the position, but that public confidence would be better satisfied with the *testamur* of some qualified body legally constituted for the purpose. We have the Chartered Institution of Civil Engineers, and the Royal Institute of British Architects, representing and having the confidence of the professions; the Universities; and the Civil Service Commissioners. In or from these, or some of them, a representative Board of Examiners might be constituted. It is of the highest importance that responsible sanitary officers should have a thorough knowledge, not only of sanitary science, but also of practical work. A very young and inexperienced man may obtain a "cram" diploma, but the practical experience of an engineer cannot be obtained by book-work. The genius of Invention, Art, and Science cannot be hedged round by examinations. George Stephenson never passed any examination. In such matters diplomas may have a fictitious value, to the detriment of real worth. Nevertheless, if by examination we can eliminate quacks, we do not object to such a test being applied to candidates for local office; indeed, we would gladly extend it also to our local governors.

During the last few years, with the extension of legislation and the better appreciation of sanitary work, the position of the municipal engineer has greatly improved. Speaking generally, the officers of the larger towns, and proportionately those of the smaller towns, have not now much reason to complain of, either as to status or remuneration. The Association has congratulated itself on this result; but recently there has been a retrograde movement. It was the general opinion of the profession that London did not attach to the office of its Chief Engineer sufficiently liberal conditions, having regard either to its importance and possibilities, or to comparison with other official positions. Unfortunately, the bad example, as is always the case, was immediately followed by the second city of the Empire, Liverpool, the conditions of which appointment, and the reduction of the previous salary by one-third, is a deliberate case of professional sweating. As a matter of fact, towns of less magnitude offer much better conditions; and as a matter of comparison, whether of rateable value, population, or importance, the anomaly is still more conspicuous. Liverpool was unjust to the profession, and its example has seriously damaged the interests of appointments of the first rank.

The municipal engineer is at a disadvantage in representing a spending department which produces no dividend, excepting in health and comfort,—matters which are not appreciated till lost. The engineers of docks, railways, gas and waterworks,—in fact, the engineers of all such quasi-public and private works,—receive better consideration, and happy immunity from the very many petty worries of public office. These private engineers generally represent interests adverse to the ratepayers, therefore the municipal engineer should be in a position to meet them professionally and socially on something like the same level, otherwise it may be to the disadvantage of his town. Public office is very harassing at the best to a sensitive and high-spirited man, and consequently it is avoided by many of the best qualified; therefore, unless sufficient inducement be offered, efficient service will not be secured. If the public service is to be put up to auction for the lowest bidder, candidates will be more numerous than select. It is not, however, suggested that the first two cities of the Empire are not at present well served in their engineering staff. Our Association has the honour of being represented in these two appointments by gentlemen of known ability, which only accentuates the argument. It is sweating! The levelling-down of salaries will result in an all-round decadence of official service, and will divert capacity into other channels where it is better appreciated.

The Chairman (Mr. H. P. Boulnois, City Engineer of Liverpool, and President of the

* Mr. Rimmer's set of drawings, to which the Medal was awarded, will be published in a future number; they are at present being exhibited out of London.

Association), in moving a vote of thanks to Mr. Angell for his interesting paper, said that, though perhaps it contained some points open to discussion, he thought that, considering the special occasion and circumstances, it would be best to regard the paper on the same footing as a presidential address, and to exempt it from any formal discussion at that meeting. He wished to say, however, that while the paper contained a very heavy indictment against the competency and general fitness of many of our local governors, he thought that there were at the present time marked signs of improvement in the characters of the men who were taking part in municipal government. As to the examination question, he believed that the reason why the Sanitary Institute held examinations for sanitary surveyors was that that body was the first to initiate such examinations. Although he (the Chairman) was a Fellow of the Sanitary Institute, and one of its examiners, he did not think, and he had never thought, that the Institute was the proper body to examine professional engineers and surveyors. He might, however, inform the meeting that that department of the Sanitary Institute's examinations was gradually dropping through, while, on the other hand, there was a great increase in the number of candidates who sought to pass the examination for Inspectors of Nuisances. In that and in other ways the Sanitary Institute was doing a very useful and valuable work, and he really saw no reason why there should be any conflict or jealousy between the two bodies.

Mr. Charles Jones (Ealing), hon. sec. of the Association, seconded the vote of thanks to Mr. Angell, and said that he agreed with the President that there was no longer any reason why there should be any antagonism between the Association and the Institute. There was certainly no desire on the part of the Association to be antagonistic to the other body, and he was glad to believe that the sore feeling which had existed at one time was gradually dying out. There was no reason why the two bodies should not work hand-in-hand.

The motion having been put and carried by acclamation,

Mr. Angell briefly replied, and said that he had no strong antagonism to the Sanitary Institute, for he was a Fellow of ten years' standing. But while he cordially agreed with what had been said as to the useful work which the Sanitary Institute had done and was doing in the promotion of a popular knowledge of sanitation and in the education of sanitary inspectors, he still held firmly to his opinion that the Sanitary Institute was not the body to hold examinations as to the competence of engineers and surveyors.

LECTURES AT UNIVERSITY COLLEGE.

ON Monday afternoon, Mr. W. St. Chad Boscawen delivered the second of his course of lectures on Babylonian Archæology, the subject being Babylonian History in relation to Archæology. He said that the period with which they were dealing extended from B.C. 4000 to 2000. He quoted numbers of examples of dates from inscriptions proving that at any rate the date of 3800 B.C. could be established historically. Yet there is considerable evidence from the cuneiform inscriptions to show that the civilisation was much older than that. Mr. Boscawen next described the pictorial character of many of the signs and syllabaries, showing that the cuneiform must have been originally pictorial, like the ancient Egyptian. It had already, at the above date, passed through several stages of development and had reached the syllable and phonetic stage. Now these stages could not have been accomplished in a few decades, but must have required a long period. It may, therefore, be concluded that the Chaldean civilisation had a very remote antiquity. Mr. Boscawen proceeded to describe some of the earliest centres of civilization. He pointed out that the sacred city of Eridu was the spot at which most undoubtedly some elements of civilization were introduced by a maritime people. There was also a probability of this being the point of contact with Egypt. The lecturer next referred to the chief city-kingdoms of Babylonia, and showed how these had grown up as independent centres of civilization,—the cities Erech, Lagash, and Sippara being most important. He described the overthrow of those kingdoms by the Elamite invasion, B.C. 2280, and remarked that this great incursion seemed to be synchronous with the migration of Abram and the Hyksos invasion of Egypt. The domination of these foreigners seems to have lasted for, perhaps, not so much as half a century, but its influence seems to have been widespread. It was, however, overthrown by Hammurabi, B.C. 2200, from whose reign the rise of the unified Babylonian empire may be said to date. Mr. Boscawen, in conclusion, described the principal features of this reign, and the wonderful public works carried out by the great builder-king. The next lecture will be on the interesting topic of Babylonian Arts and Crafts.

THE LONDON COUNTY COUNCIL.

THE ordinary weekly meeting of the London County Council was held on Tuesday afternoon last, Sir John Lubbock, Chairman, presiding.

Tenders.—Tenders were received for the erection of a Weights and Measures Office at Newington, and referred to a committee for consideration. The list will be found in our columns this week under the head of "Tenders."

The Bethnal Green Slum Clearance Scheme.—The greater part of the sitting was devoted to the consideration and discussion of the Report of the Housing of the Working Classes Committee on the Boundary-street Area scheme, Bethnal Green. The report contained the following passages :—

"*A.—Carrying out of the Scheme.—Proposal to deal with the Area in Sections.*

Feeling confident that the Council would desire to cause as little inconvenience as possible to those who at present live there, and having regard to the difficulty of finding accommodation for them elsewhere, your Committee have decided to recommend that the area be dealt with in sections. Hitherto when large schemes have been carried out, clearances have not, as a rule, been effected by sections, nor has accommodation been provided beforehand into which those first displaced could be at once moved. A wholesale clearance of the Bethnal-green area would render it impossible to make provision beforehand for those removed, would seriously inconvenience them in their various occupations, and would tend to cause overcrowding in adjoining districts. For these reasons your Committee are of opinion that it is necessary to divide the area into three sections, as affording the best means of carrying out the scheme successfully, and with the least harm to those concerned. It is proposed first to clear Section I. This portion is selected as it contains some of the most insanitary parts of the area. When Section I. is cleared, and dwellings for the working classes are erected, Section II. will be commenced, the newly-erected dwellings in Section I. providing accommodation for the majority of those now resident in Section II., if they desire to avail themselves of it. When new buildings are erected on Section II., Section III. will be dealt with in the same manner. There will be displaced from Section I. about 1,860 persons ; in Section II. about 2,050 ; and in Section III. about 1,810 ; making a total of about 5,720 persons. In four-storied dwellings there will be ultimately re-housed on Section I. about 1,180 persons ; on Section II. about 1,800 ; and on Section III. about 1,620 ; making a total of about 4,600 persons. Thus 1,120 persons less will be housed on the area, but the present proposal provides for 2,000 elsewhere, and, therefore, it may be found possible to use part of Section III. for other purposes of a more remunerative character. It must, of course, be understood that it is only the duty of the Council to provide for persons equal to the number of those displaced. Experience proves that many of the latter will not avail themselves of the accommodation provided for them. While Section I. is being dealt with, Sections II. and III., with the exception of houses totally unfit for habitation, will have to be kept in temporary repair, and the rents collected. The question of the maintenance of property let to tenants, and not immediately required for demolition, received special consideration by the late Metropolitan Board of Works in 1883-4. It was then contended that the more economical plan would be to close all the houses immediately they were required. It was ascertained, however, that, after allowing for repairs, rates, taxes, and expenses of management, there remained an excess of income over expenditure. The proposal, therefore, to carry out the scheme in sections will entail no extra expense, while it meets to a great extent the re-housing difficulty.

B.—Re-housing.

As has already been stated, the total number of persons belonging to the working-classes who now live on the area amounts to 5,720. By law, unless special circumstances render it unnecessary, accommodation must be provided for at least as many persons as may be displaced in suitable dwellings situated within the limits of the scheduled area, or in the vicinity thereof. Your Committee are not aware at the present moment of any special circumstances rendering this unnecessary, and they therefore consider the Council bound to find suitable accommodation for the total number to be displaced.

Accommodation for Tenants removed from the most Insanitary Houses.

In order to carry out the above-mentioned duty, your Committee have had first to consider how to rehouse those who are living in the most insanitary houses, which would be closed immediately on the Council obtaining possession. The number of these houses is 65. Thirty are closed, and the remaining 35 are occupied by 288 persons, for whom suitable dwellings must be provided.

Goldsmith-square Site.

To meet this want, your Committee have made inquiries as to vacant land in the vicinity of the area, and have ascertained that the only vacant site that can now be acquired is the Goldsmith-square site. It is distant, as nearly as possible, 1,000 yards from the Boundary-street area. Its present area is 47,854 square feet, or 1·098 of an acre ; and the frontage to Goldsmith-row is still occupied by small houses and shops, some of which have been closed.

If the Council purchases this site, the building lines in Goldsmith-row and Goldsmith-square would be set back, which would reduce the area for building purposes to about 36,000 square feet, or ·83 of an acre. There will be a frontage of about 180 ft. to Goldsmith-row, and about 300 ft. to Goldsmith-square, and the new buildings will reap the advantage of increased light and air. Buildings of four floors will accommodate 500 persons, with proper provision as regards baths and washhouses. The price which the owners have agreed to, subject to the approval of the Council, is 8,500*l.*, equal to an annual rental of about 2d. per foot. The estimated cost of the buildings, which will contain about 250 rooms, will be 16,000*l.* :—

Cost of land	£8,500
Estimated cost of buildings	16,000
Total	£24,500
Interest at 3 per cent.	£735
Repairs and outgoings	487 10
	£1,222 10
250 rooms at 2s. per room (average size 1,206 cubic feet) =	£1,300

Your Committee are of opinion that in order to meet the initial requirement it is necessary to acquire this site without delay, under Part III. of the new Housing Act, and thus to be prepared to move those first displaced into dwellings, which under the provisions of the Act must be erected and managed by the Council. The Council will, therefore, be able to test by experience the possibility of moving those displaced into other quarters. Part III. of the Act, formerly known as Lord Shaftesbury's Lodging House Act, has never been put in force in London, with the exception of the lodging-house to be erected by the Council on the Shelton-street area. If the Council authorises this proposal, the sanction of the Home Secretary will have to be obtained, but there is every reason to believe that in order to carry out the duty imposed on the Council by Part I. to provide accommodation, the assent of the Secretary of State will be given to the employment of provisions under Part III. for that purpose. It may be added that after seven years it will be in the power of the Council to sell the dwellings for the best price that can reasonably be obtained for the same, but this is not the present intention or proposal of your Committee.

Accommodation for those removed from Section I.

Having thus provided for 145 persons removed from the worst houses in Section I., and for 143 persons from Sections II. and III., accommodation will have to be found for 1,712 persons when Section I. is cleared. Your Committee propose to find this accommodation in the following manner :—

(*a*) *Removal to the Suburbs.*—First, your Committee deemed it expedient to ascertain amongst the working classes over the whole area how many were willing to remove to the suburbs. The result of these inquiries showed at first that about one-tenth (180 from Section I.) declared themselves ready to move outside the metropolis. It has lately transpired, however, that this number may be decreased unless special inducements are offered.

As the Great Eastern Railway, which is at the head of the metropolitan railways in giving facilities for workmen's trains, passes through Bethnal Green, your committee have caused inquiries to be made as to suitable accommodation on that line. They have ascertained, that within five minutes' walk of the various stations there are at the present time 168 empty houses, and 37 houses partly vacant. The total number of rooms available is 1,014, or accommodation for about 2,028 persons. These houses are within the limit of the 2d. workmen's return fare, and about five minutes' walk to the stations. At Enfield, houses of six rooms, newly built and in good repair, can be hired at 5s. and 5s. 6d. per week. Houses with four rooms can be hired at 4s. 6d. a week. At Ponder's-end, cottages are let at 4s. 6d. or 5s. for four rooms within half a mile of the railway station. Workmen's tickets are 1s. a week. The same prices are found in Lower Edmonton and White Hart-lane. Rents elsewhere vary from 6s. to 7s. a week for five and six rooms.

There will, therefore, be no difficulty in obtaining suitable accommodation for all those who are willing to move to a distance, but your Committee are aware that but a small number will avail themselves even of cheaper and better dwellings when they are at a distance from town life.

(*b*) *Guinness Dwellings.*—Secondly, workmen's dwellings are in course of erection by the Guinness Trustees about 850 yards from the Boundary-street area. Your Committee therefore communicated with the trustees, asking whether they would be able to accommodate some of those to be removed from the area. A courteous answer has been received, stating that it is their intention to endeavour to house a class of persons who are not usually provided for in the existing artisans' dwellings,—namely, the very poor who earn small wages; and that they desire to consider primarily applications coming from the immediate neighbourhood. Under these circumstances the trustees are unable to enter into any engagement to house even temporarily persons not within the limitations mentioned. They add, however, that they have every desire to assist the Council as far as possible, and they will give every consideration to applications coming from suitable persons who may be displaced by the scheme of the Council. As many of the tenants on Section i. belong to the class whom the trustees desire to house, your Committee feel assured that they can rely upon the assistance of the trustees in the matter. The Guinness Dwellings will accommodate probably about 1,500 persons, to be ready in the spring of 1892, and it is not too much to hope that 480 will be housed therein from the Boundary-street area. It may be added that an increase of vacant accommodation in this neighbourhood will be caused by the action of the trustees.

(*c*) *Gossett-street site.*—Thirdly, the Council has already been informed that cottage dwellings are to be erected by private enterprise on the vacant Gossett-street site, which is within a quarter of a mile of the Boundary-street area. There will be accommodation for about 200 persons, and it is the intention of your Committee to enter into communication with the owner to take as tenants some of those who will be displaced under the proposed scheme.

(*d*) *Vacant accommodation in the neighbourhood.*—Lastly, the number of vacant rooms within half a mile of the area is 790, which would accommodate about 1,580 persons. The weekly rents of the large majority of these rooms (675) are about the same as in the insanitary area—*i.e.*, from two to three shillings a room. In the remaining 115 the rent exceeds 3s. per week. It will be the duty of your Committee to give information to those displaced as to this vacant accommodation, into which at least 700 will have to be moved. It must be borne in mind, however, that this accommodation is not of a very good class, and that it would only be possible for the Council to give information with regard to those tenements which are sanitary and in good repair. It would, moreover, be unwise to count upon more than a minimum of this accommodation at a future date.

It may be convenient to summarise the proposal of the Committee as to the rehousing of those to be first displaced.

DISPLACEMENTS.

Removals from worst houses on Sections ii. and iii.		143
Removals from Section i.		1,857
		2,000

PROVISION IN NEIGHBOURHOOD.

Goldsmith-square site		500
Gossett-street		200
Guinness-buildings	1,500	
Vacant accommodation within ½ mile	1,580	
	3,080	
Proportion of above which may be calculated on as available in 1892	1,300	
		1,300
		2,000

SUBURBAN ACCOMMODATION.

168 empty houses within easy reach and available for 2,000 persons. Apart from fresh building, it may be calculated that a quarter of these houses might be available in 1892, so that as many as would go to the suburbs could be provided for, and the required accommodation in the neighbourhood would be thereby decreased.

C.—Time required to carry out the scheme.

It is impossible to state with any certainty the time required to carry out the scheme, but your Committee are informed that, judging by former schemes, the first section could not be cleared in less than two years from the date of the confirming Act. Your Committee will make every effort to prove that this delay is unnecessary. A further period of about eighteen months would then be required for the paving work and the erection of buildings. The clearing, paving work, and building on the second section would require another eighteen months. It would therefore be about five years from the date of the confirming Act before the clearance of the third section can commence. This delay is caused at the commencement by the fact that the compulsory acquisition of the interests of all the owners and lessees for the whole area must take place at the same time, and, as negotiations must occupy some time, it would probably be six months after passing the confirming Act before schedules could be deposited at the Home Office, and the Home Secretary be asked to appoint the arbitrator. Hearing the disputed cases would also occupy some considerable time, and the arbitrator's award would not be issued for at least another six months. Each party would then have the right to compel the Council to proceed with the purchase, but, subject to complying with requests of pressing claimants, the attention of the conveyancing department would be first concentrated on Section i.

The confirming Act will probably be passed in July next, 1891, and the arbitrator's award on disputed cases would be issued about July, 1892. After the settlement of the purchase of Section i. it will be cleared by about July, 1893, and the paving work will be completed and dwellings will be erected about January, 1895. Dwellings on the second section would be ready about July, 1896, when the third section would be cleared. It has already been stated that after the whole area is acquired (about November, 1892) Sections ii. and iii. will be held and managed by the Council without any loss.

D.—Finance.

It remains only for your Committee to report as to the estimate of receipts and maximum expenditure on capital account—

Estimate of Receipts and Expenditure on Capital Account.

RECEIPTS.

Date.	Description.	Amount.
1893-4	Sale of land for building workmen's dwellings	£4,000
1894-5	"	36,000
1895-6	"	4,000
1896-7	"	38,000
1897-8	"	24,000
	Balance—net cost	300,000
		£406,000

EXPENDITURE.

Date.	Description.	Amount.
1891-2	Preliminary expenses, cost of local inquiry, expenses in Parliament, purchases of property by negotiation, costs of arbitration	£100,000
1892-3	Costs of arbitration, purchase of property by negotiation and under arbitrators' award	200,000
1893-4	Purchase of property under arbitrators' award, cost of new roads	70,000
1894-5	Purchase of property, cost of new roads	12,000
1895-6	Purchase of property, cost of new roads	12,000
1896-7	Purchase of property, cost of new roads	12,000
		£406,000

Recommendations.

Your Committee, having now laid before the Council all the information they possess, and their proposal as to the carrying out of the scheme authorised by the Council, recommend,—

'1. That the Council do approve of the proposed manner of dealing with the Boundary-street area in three sections.'

'2 That subject to an estimate being submitted to the Council by the Finance Committee as required by the statute, and to the consent of the Secretary of State, the Goldsmith-square area be purchased by the Council for £8,500, under Part III. of the Housing of the Working Classes Act, 1890.' "

On recommendation No. 1, Mr. John Hutton moved, as an amendment:—

"That the Boundary-street area, if the improvement is sanctioned by Parliament, be dealt with in four sections instead of three."

Mr. Hutton argued that the division of the area into four sections would be found far more economical and convenient than its division into three sections.

On a show of hands, the amendment was defeated by a large majority.

Mr. Charles Harrison then moved, and Mr. Debenham seconded, the following amendment:—

"That recommendation No. 1 be referred back to the Committee with an instruction that the Committee do proceed with the acquisition at the earliest date for the purposes of demolition of all such houses, courts, and alleys included in the Act to be passed authorising the scheme as, at the date of such acquisition, are unfit for human habitation, and that the Council do not hold or manage any of the houses comprised in the area of the scheme, and which, in the official representations which the Council took into consideration and were satisfied of the truth thereof, were stated to be unfit for human habitation."

On a show of hands, the amendment was lost by an overwhelming majority, after which, recommendation No. 1 was agreed to.

On recommendation No. 2, Mr. Rhodes moved that it be disagreed with.—This amendment was supported by Mr. Hutton, Dr. Longstaff, and others.—Upon a division it was lost by 41 votes against to 31 for.

Mr. Hutton moved, and Mr. Roberts seconded, an amendment to refer the matter back, but, on a show of hands, it was defeated by 35 votes against 27.

Mr. Leon then moved that the words "Part III. of" should be omitted from the recommendation, explaining that he did not desire the Council to carry out the building operations itself. This was carried by 39 votes against 34, and the recommendation as amended was approved.

After transacting other business, the Counci adjourned.

ARCHITECTURAL SOCIETIES.

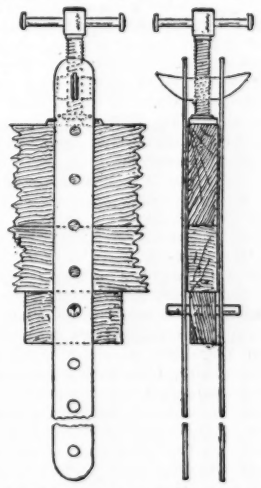
GLASGOW ARCHITECTURAL ASSOCIATION.—The fifth lecture of the present session of this society was given on the 20th inst. by Mr. John Scott, decorator. The President, Mr. William J. Anderson, occupied the chair. The lecturer's subject was "Decoration," particularly as applied to the adornment of wall surfaces, and his paper was illustrated by a collection of Japanese vases, wall-hangings of different kinds, stained wood panels, photographs, and designs. A hearty vote of thanks was passed to Mr. Scott.

DUNDEE INSTITUTE OF ARCHITECTURE, SCIENCE, AND ART.—The Council of this Institute have arranged for opening a room in the office of the Hon. Sec., Mr. John James Henderson, 8, Bank-street, Dundee, as a library and consultation-room for the use of members. This arrangement is only regarded as a first step towards the attainment of permanent premises for the Institute.

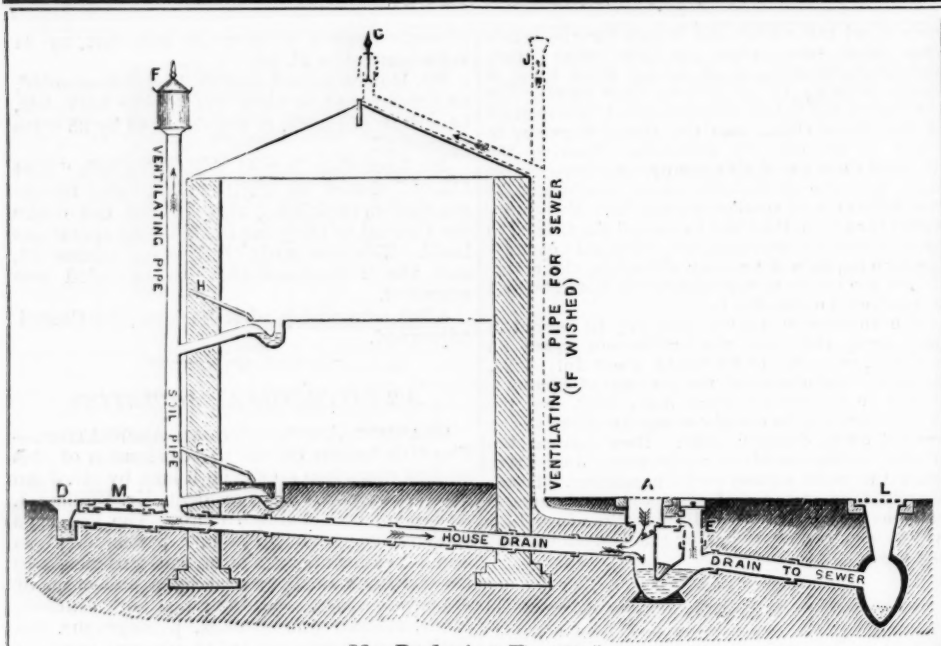
OBITUARY.

FRIEDRICH VON SCHMIDT, architect, whose decease on January 23 at Vienna is announced, was born on October 22, 1825, at Frickenhofen, Württemberg. He commenced his studies at the Polytechnic School at Stuttgart under Mauch and Breymann, where he also learned the trade of stonemason. In 1843 he went to Cologne, and was employed as a journeyman at the restoration of the cathedral. In 1848 he became master stonemason, and in 1856 he passed the Government examination as "Baumeister" at Berlin. In the competition for the Vienna Votive Church he gained the third prize, and in that for the Berlin Town-hall the first prize. In 1857 he followed a call as Professor of Architecture to the Milan Academy, and was charged with the restoration of San Ambrogio, a work interrupted by the Italian war. Since 1859 he filled the post of Professor at the Academy of Fine Arts in Vienna. He built the Lazarist Church there, the parish church at Fünfhaus, and the Gothic church at Graz. In 1862 he was appointed architect of St. Stephen's. His other principal works, besides the Vienna Town-hall (his masterpiece) and the Sühnhaus (the Votive chapel erected on the site of the Ringtheater), are the Academic Gymnasium and the restoration of St. Stephen's. After the inauguration of the Town-hall, which took place on September 12, 1883, he was ennobled, receiving the title of "Freiherr" (Baron).

PATENT SCREW CLAMP.—The accompanying sketch shows the "Excelsior" screw clamp, made by Mr. F. Greenaway, of Slough. The advantage claimed for it is that it draws up the work equally on each



side. The side plates are of bright steel, which are supplied to any length, so that several pairs can be had for the same head. The block is of hard wood, with a steel pin fixed in it.



Mr. Buchan's "Fig. 273."

Correspondence.

To the Editor of THE BUILDER.

VENTILATORS TO SOIL-PIPES.

SIR,—Mr. Sugg, on page 72, states that my remark on page 52 that I did not "at present" believe that he and Mr. Simmance had any practical idea of ventilating drains or soil-pipes with the water-current (as illustrated by him on page 34) until after the appearance of my letter in the *Builder* of November 8 last is "unwarranted." Now, by using the words "at present," I left it open for Mr. Sugg to give *some satisfactory evidence* that he and Mr. Simmance really had published this idea *before then*, but he has not given any such evidence. Moreover, he has not even asserted he could produce such. The words, "always had in view," are rather vague as to time. Does this "always" mean five days or five weeks, or how long?

For either Mr. Sugg or Mr. Simmance to pose as a plumbers' teacher on the basis of retailing to them, in 1890-91, as new, ideas and plans which they—the plumbers—have known about for years back, is not good enough.

Plumbers have carried out in practice, on a better plan than is shown on p. 34, the idea of making the air and water currents both go the same way, so they did not require Mr. Sugg to pretend to teach them what they knew much better already without him.

In reference to my fig. 6 on p. 52, Mr. Sugg tells us that he viewed the close-plates over the trap with a magnifying glass, and they are not plates, but "gratings."

Now, had he applied the magnifying-glass to his brain instead of to his eye, he would have known that what he took for microscopic openings were the spaces between the lines of the hatching. In the 1883 drawing the plate above the house-side of the trap is marked by a thick black line. To have shown or put in an open grating over the trap with a side high level outlet or inlet would have defeated the object in view. So on pages 224, 239, and 254 of my text-book on plumbing I speak of "an iron close lid," "a solid plate," and "an iron plate," as being placed over the top of the disconnecting-trap in the circumstances. Figs. 283 and 293 indicate these solid plates, and show them clearly on a larger scale.

We need not leave fig. 273 in my book, however, which on page 52 caused me to say that Mr. Sugg's pseudo new plan was similar to it, for in it the close lid and solid plate are distinctly seen above the side connexion. All the difference that I can see between Mr. Sugg's drawing on page 34 and my old one is that he has added a story to the house, and joined the blow-off pipe to the house-side of the trap with a plate over the trap; and he omits to ventilate the sewer, and shows only one ventilator, just as I had already done years ago, only my fig. 6, on page 52, is free from Mr. Sugg's mistakes, on page 34, of showing four fresh-air inlets, and imagining that with these the air would come down the soil-pipe as intended!

This glaring mistake shows clearly how little he really knows of the subject, while his attempt to justify himself on the plea that these extra inlets are in my old drawing only makes matters worse for him. His alteration at the trap altered the conditions, while, in 1891, he, while presuming to teach plumbers, should have advanced upon 1883 plans, instead of making things worse.

Mr. Sugg asserts he never recommended his valve-ventilator for use "on the top of a soil-pipe." I beg to point out that it was publicly stated that one was to be seen "covering a soil-pipe" at Messrs. Sugg's works in Regency-street. Now, I imagined that "covering" was equivalent to "on the top of." The drawing accompanying this statement showed Mr. Sugg's cowl, but the valve inside was not that in either his or Mr. Simmance's specifications, but the old sloping hinged valve, in my style.

I do not assert that *now*, after this discussion, Messrs. Sugg & Co. will recommend valve ventilators for topping or covering soil-pipes. I may point out, however, that Mr. Sugg's drawing on page 34 is more for ventilating the *drain* than the soil-pipe. To ventilate the soil-pipe *per se* with air and water currents both going down it, he might have altered fig. 269A in my book by showing the rain-pipe as the foul-air outlet, and, taking the ventilator off the soil-pipe, put it on to this air-pipe, said air-pipe being carried up to a proper height. A solid plate to be put on above the house side of the trap.

Mr. Sugg admits that my fig. 5 cowl, on page 52, is like his new one. In that case, as my one is the older of the two, where is the foundation for his patent, unless for the addition of the small tube to Simmance's pot-lid valve?

I consider this pot-lid valve or disc, as shown on page 51, much inferior to my older hinged valve for use in ventilators upon buildings,* and this valve and ventilator, as per fig. 5, page 52, is public property, and hard fire-clay rests can be used for the valve if wished. This hinged valve was never known to Dr. Arnott that I know of, and especially not for use inside an outside ventilator, as per figs. 4 and 5 on page 52. Mr. Simmance, under date September 11, 1890, wrote that the Sugg ventilator with the balanced-hinged valve in it "is one of the forms under the patent." Under what patent? He said, "Being counterbalanced, it is very sensitive." It so happens, however, that this counterbalancing plan was published by me in 1878. Supposing some other person invented it before me, that makes the attempt to claim it anew in 1890 no better.

In concluding, Mr. Sugg says he did not experiment with his valves with candles inside a building, but in the open air. I also experimented with his ventilator in the open air, when my ventilator beat his by several hundred linear feet of greater updraught per minute, while in one of the tests, *in the open air*, the plain open pipe beat his ventilator.

W. P. BUCHAN.

P.S.—As it may be both interesting and useful for the readers of the *Builder* to be able to compare Mr. Sugg's drawing on page 34, with my old fig. 273 drawing, I send block of same, and then these two can be compared along with my fig. 6 plan on page 52. All of these plans are inferior to others I have. W. P. B.

*** We fear we cannot extend this correspondence further. By way of a word of entirely impartial comment, we may observe that we think Mr. Buchan's very small diagram on page 52 was misleading; we, at all events, took the dots over the trap to mean an open grating. Mr. Sugg has certainly some excuse for his remark that Mr. Buchan, while condemning Mr. Sugg's separate branch air-pipes, had shown the same thing himself in one of his own diagrams, the one reproduced with this letter. On the other hand we consider Mr. Buchan is right in saying that in Mr. Sugg's system shown on page 34 the vertical fresh air pipe, especially if on the south side of the building, cannot be depended on to act as an inlet under all circumstances, and if it became an upcast, it would probably be drawing sewer air into the soil-pipe instead of fresh air. Mr. Sugg's system is admirable as long as it acts as intended, but we do not think it can be depended on to do so.—ED.

* If a building could be sent flying through the air at ten miles an hour on a calm day, then a motive power would be got to raise the pot-lid valve or disc, but we cannot manage that.—W. P. B.

"BROKEN CROCKERY MOSAIC."

SIR,—Referring to a paragraph on page 72 of the last issue of the *Builder*, will you allow me to mention that "broken crockery mosaic" was described, with full instructions for carrying it out, in the *Art Journal* for 1886?

It would seem, therefore, that the particular example to which the paragraph refers cannot well justify any "claims to be a *new* kind of mosaic pavement." It very possibly originated even earlier than 1886. T. O. HINTON.

14, *St. Mary Axe*, January 26, 1891.

The Student's Column.

VENTILATION AND WARMING.—V.

NATURAL VENTILATION THROUGH POROUS ENCLOSURES.

OF very great importance in connexion with any application of ventilation is that form of natural ventilation which we may call "involuntary" ventilation, the result of the diffusion of the internal and external atmospheres through porous walls, ceilings, and floors, and through more or less imperfectly-fitting doors and windows. This "involuntary" ventilation is of greater or lesser activity according to the variation of the difference of internal and external temperature, the variation of wind-pressure, and the nature of the materials of which the walls, &c., are constructed. The change of atmosphere is not, however, to be considered due only to temperature difference or wind-pressure. Even if both these assistant agencies were inoperative, if the internal and external atmospheres were of the same temperature and at the same pressure, there would still be a constant change through porous substances by the operation of the diffusion of gases.

So great is the effect of this involuntary ventilation that, in many rooms, with the doors and windows shut, the internal atmosphere, with a difference of temperature of, say, 30 deg. Fahr., will be completely changed in the course of a single hour, quite independently of any ventilation from chimneys and fires or other means.

We need hardly be surprised at such a result as this, when we remember that many of our building bricks have so much porosity that they will absorb one-sixth of their weight, or one-third of their bulk of water; and that air is nearly 800 times more fluid than water; hence the permeability of our construction to the air must be considerable.

The precise extent of the atmospheric change occurring under various circumstances is difficult of calculation. We have not as yet sufficiently reliable data to enable us definitely to state what, in any particular case, may be relied upon to occur by the operation of this form of natural ventilation.

Investigations have been conducted by several physicists, especially in Germany, but the results of their inquiries have not been sufficiently harmonious to justify the adoption of any universal rules or the deduction of any general laws.

Thus Pettenkofer, experimenting on the air of a room with stone walls, found that, with a difference between the temperature of the internal and external atmospheres of 19 deg. Cent., the extent of air-change in one hour amounted to 1·14 cubic mètres for each square mètre of wall-surface, which we may in round figures express in English nomenclature as a change of 4 cubic feet an hour for each square foot of wall-surface, with 30 deg. Fahr. difference of temperature. Pettenkofer's experiments were made by the estimation of the amount of carbonic acid in the atmosphere at certain intervals of time; hence in such an experiment the change due to simple diffusion of the gas, independently of the difference of temperature, is a source of error, which is still further increased by the variation of the specific gravity of the internal atmosphere caused by the artificial addition of the heavy carbonic acid for the purpose of experiment.

Other investigators, Schulze and Maerker, as the result of their experiments with walls of

various material found that, with a difference of temperature of 19·3 deg. Cent., the following amounts of air passed through a square mètre of wall surface in one hour for each material respectively:—

	Cubic mètres.
Sandstone	1·69
Limestone...	2·32
Brick (ordinary)	2·83
Tufaceous limestone*	3·64
Brick (loamy and porous) ...	5·12

From these figures we can at least see that the diffusion of air through the pores of walls differs largely according to the material of which the wall is composed, although we may not be able to precisely determine the facility of diffusion afforded by any particular structure, since hardly any two kinds of stone or brick, for example, will give precisely similar results. The thickness of the walls and their hygrometric state, as well as the nature of the material with which they are covered, also largely influence the rate of diffusion.

Further experiments in the same direction have led Dr. Lang to the determination of a series of co-efficients or constants for various materials by means of which the following formula may be utilised for particular cases:—

$Q = \frac{c\,p\,q}{d}$, where Q is the amount of air in litres or cubic decimeters passing per hour through the wall; c, the constant or co-efficient of permeability of the material; p, the wind pressure per square centimetre in kilograms; q, the extent of surface in square centimetres; d, the thickness of the material in mètres.

The co-efficients determined experimentally by Lang for various materials are as follows:—

Sandstone	0·124
Brick	0·203
Plaster of Paris	0·041
Mortar	0·907
Concrete	0·258
Oak boarding	0·007
Deal boarding	0·010

In calculating for brickwork or stonework in mortar, one-third of the cubic contents of rubble stone wall are assumed to be mortar, one-fifth to one-sixth of brick walls, and one-sixth to one-eighth of ashlar walls, and from this a proportional co-efficient for each can be obtained.

Further, the effect of coating the wall with various media has been determined as follows:—With ordinary oil-paint the amount of diffusion is reduced to three-quarters of the normal; with distemper colour to one-half; with one coat of oil-varnish to two-thirds; with two coats of oil-varnish to practically nil; with tapestry hangings to a quarter or half the normal.

If the substance of the wall is soaked with moisture, the diffusion through it is reduced to one-quarter of that through a dry wall.

From these investigations we learn that there is a considerable, if not accurately determinable, interchange of external and internal atmosphere by diffusion through the pores of walls, ceilings, and floors, varying in extent according to the material of the structure, the difference in density of the atmospheres, whether caused by difference of temperature or by wind-pressure, or otherwise, and also varying with the dryness of the walls. Hence, from this cause, newly-built walls admit of less diffusion than those dried by time, and so we thus have one reason for the superior healthiness of well-dried buildings over those newly-built.

In our first chapter it was noted that a considerable difference exists between the amount of fresh air that has been theoretically considered necessary for each individual, and the amount actually provided by means of applied ventilation in modern practice. We now see that one cause of the diminution of the theoretical amount, or rather one way in which part of the requisite amount is supplied, is by the inevitable diffusion through the enclosure of an apartment. In the ventilation of mines, where diffusion through the enclosure is practically nil, the actual amount of fresh air required, as proved by experience, we have already stated approximates very closely to that arrived at by theoretical deduction.

We have also to take into consideration the further ventilation of an involuntary character which takes place through the imperfect fitting of doors and windows, and which is also an important factor in the question of ventilation as a whole, and particularly as applying to domestic buildings.

* This would be a highly porous limestone, resembling that now being used by Mr. Herkomer for the walls of his new house at Bushey.

GENERAL BUILDING NEWS.

THE ROYAL ENGLISH OPERA-HOUSE. — Mr. D'Oyly Carte's new theatre in Cambridge-circus, at the junction of Shaftesbury-avenue and Charing Cross-road, is to be opened this Saturday, January 31. We gave an external view of the building in our number for the 3rd inst. Mr. T. E. Collcutt has designed the façades, as well as the internal decorative work. The whole of the constructive work has been executed from plans prepared under the superintendence of Mr. G. H. Holloway, who has also superintended the whole of the works, no general contractor being employed, Mr. D'Oyly Carte being "his own builder." The construction is claimed to be absolutely fireproof throughout, and the theatre will not be insured. It is completely surrounded by streets on all sides, and thus there are great facilities for entrance, exit, lighting, and ventilation. The building presents many special points worth noting, but we are compelled, by pressure on our space, to hold over a detailed account of it until next week.

THE KING'S CROSS RESTAURANT. — This new restaurant, just opened by Messrs. Reggiori Bros., is situate in the Euston-road, near the corner of Liverpool-street, and opposite the termini of the Midland and Great Northern Railways, and is one of the best-appointed establishments of its kind in London. It occupies some of the buildings which were until lately private houses, and also extends over the front garden ground, the one-story buildings being brought out to the pavement line of Euston-road. Accommodation is provided for about 140 persons to dine at once in the main *salon*, leading out of which is an annexe having an entrance from Liverpool-street. The whole of the surface of the interior walls and ceilings (where not covered by mirrors) is lined with tiles of Burmantofts faïence of quiet but effective design and colour. The interior is bright and pleasing, and devoid of the garishness so often characteristic of such places. The constructional work has been of a somewhat unique character and of great danger, consisting of throwing three shops and two private houses, all of different levels, into one building. Four of the party walls and also the external walls in some cases have been entirely removed. At one time three of the main walls of one of the structures were removed together, and every wall throughout the block has been underpinned to a depth of some 6 ft. and the internal area excavated to form kitchen, &c. The architect is Mr. Robert Willey, F.R.I.B.A., of Ludgate-hill, assisted by his son, Mr. Francis Willey. The general contractor was Mr. Howell J. Williams, of Bermondsey-street, some of the other firms engaged in the work being as follow:—Tile-work and faience, The Burmantofts Co., Leeds; mosaic, Messrs. Webb, of Euston-road; mirrors, Messrs. W. D. Sims & Co., of Great Eastern-street; culinary appliances, Sig. Ceresa, of Westminster Bridge-road; internal fittings, Mr. H. Hanks, of Berners-street; electric-lighting and gasfittings, Messrs. Strode & Co., St. Paul's-churchyard; stained-glass by Messrs. James & Co., of Kentish Town; and lifts by Messrs. Waygood & Co.

ABATTOIRS, DOUGLAS, ISLE OF MAN.—The new public abattoirs, on a site near the railway station, and removed from populous districts, were commenced last week. The buildings are being erected from the plans and under the supervision of Mr. Thomas W. Cubbon, architect, of Birkenhead, whose designs were selected in an open competition some time since. The scheme provides the following accommodation:—Public slaughterhouse, 56 ft. by 25 ft., with lairages at the rear for thirty-six cattle and 114 sheep or calves. Eight private slaughterhouses, each having at the rear lairage accommodation for eight cattle and thirty sheep; general cooling-house or dead meat-market, 125 ft. 6 in. by 25 ft., capable of hanging about 170 cattle carcases and 308 sheep or calves. The pigs' department consists of slaughtering-pen, dressing-house, and cooling-house for about sixty carcases, and having pens for about forty-five animals. A suspected-cattle slaughter-house and lairage and also gut-cleaning premises have been provided. The administrative department includes superintendent's dwelling-house and office; medical officer's room; weighing office; boiler-house, &c. The total cost of the buildings, including concrete foundations, will be about 5,000*l*. They are being carried out by Mr. William Kelly, contractor, of Douglas. Mr. George Cain supplying the ironwork fittings.

HYMERS' COLLEGE, HULL.—On the 21st inst., Alderman J. T. Woodhouse laid the foundation-stone of Hymers' College, Hull. The architects of the new building are Messrs. Botterill, Son, & Bilson, of Hull. We gave a description of the new building, and a double-page illustration of it, in the *Builder* for June 28, 1890.

PROPOSED NEW CORN AND GROCERY EXCHANGE, MANCHESTER.—It is proposed to erect on the present site of the Manchester Corn, Grocery, and Produce Exchange, a building which will provide more than twice the accommodation now available. The site has frontages of 99 ft. to Hanging-ditch, 198 ft. to Fennel-street, and 162 ft. to Half-street, from each of which thoroughfares it is proposed there shall be an entrance to the new Exchange. The new building, which will have a central dome of 84 ft. in diameter, will have an area more than double that of the present Exchange, and by the arrangement of the building ready access can be obtained to every part, while a gallery will be carried round the side walls on which a series of private boxes or offices will be constructed. The present accommodation admits of 250 stands; in the new buildings provision will be made for 690 stands. Designs have been prepared by Mr. Thomas Mitchell, of Manchester.

CHARTER-STREET RAGGED SCHOOLS, MANCHESTER. —The contract for the erection of the Charter-street Ragged Schools, Manchester, has been let to Messrs. Peters & Sons, builders and contractors, of Rochdale, their estimate being 4,280*l*. The architects for the work are Messrs. Maxwell & Tuke, Manchester.

BRISTOL.—The Kingswood Reformatory, near Bristol, is about to be rebuilt from the designs of Mr. H. C. Hirst, architect, of Bristol. The contract for the first portion of the works has been given to Messrs. I. Roach & Sons, of Charfield, Gloucestershire.

EDINBURGH.—It is proposed that the managers of the Edinburgh Royal Infirmary should extend the buildings, in order to provide additional accommodation for the number of outdoor patients, which is increasing; and the site of the Sick Children's Hospital, which adjoins the Infirmary, is considered to be a suitable one for the proposed new buildings. It is known that the Managers of the Sick Children's Hospital intend to erect new buildings, whether on the present site or elsewhere has not yet been determined.

THE CHANCEL OF ST. MARK'S CHURCH, GLOUCESTER. —The chancel of the church of St. Mark, Kingsholm, Gloucester, was consecrated on the 20th inst., after undergoing alterations. Before the alterations the chancel arch was very small and narrow, and the chancel itself was low and dark. The chancel arch has been widened and raised, as has also the arch of the organ chamber, and the chancel walls have been raised about 8 ft. They have also been extended a little more than a yard to the edge of Worcester-parade, and in place of the small window formerly in the east wall a three-light window has been placed. There are also clearstory windows on the south side. The chancel has been entirely re-arranged and paved with Godwin's encaustic tiles, and the choir stalls are new, and of oak and walnut. The altar has been raised. The pulpit is of oak and walnut, with tracery and carved panels, and stands on a carved and moulded Painswick stone base, with steps of the same material. It has been executed and fixed from the architect's design by Mr. Henry Frith, sculptor, of Gloucester. The whole of the improvements, as well as the pulpit and choir stalls, were designed by Mr. R. W. Drew, of Torquay, and, except the pulpit, have been executed by Mr. Alfred King, of Gloucester.

PAROCHIAL BUILDINGS, KENSAL TOWN. — On Monday last, Mr. C. A. Whitmore, M.P., opened the new block of parochial buildings in connexion with St. Thomas's Church, Kensal-road, W. The new buildings comprise a large central hall, 60 ft. by 26 ft., partly lighted by a lantern running almost the entire length. Meetings, entertainments, &c., will be held in this hall, which is also fitted with complete apparatus for a gymnasium. Upon one side are three separate class or committee rooms, but which, being separated from the hall by Braby & Thornborough's folding shutters, can be utilised as an addition to the hall in a few moments; while a library and reading-room, with suitable offices, occupy the opposite side. At one end is the kitchen, fitted with gas-cooking apparatus, to be used for parochial purposes. The walls are faced with red brick from Gainsborough, the roofs being covered with permanent green slates. The floors generally are laid with Gregory's wood blocks, and the porches and passages with Stuart's granolithic paving. The heating is by Mr. J. Grundy. The architects are Messrs. Demain & Brierley, of York; and Messrs. Thomas Gregory & Co., of Clapham Junction, were the builders, Mr. J. Newton superintending the work as foreman.

NEW PULPIT, AXMOUTH CHURCH.—A new pulpit in carved oak has just been placed on the north side of the nave of the church of St. Michael and All Angels, Axmouth. It is octagonal on plan, and of fifteenth-century style of architecture. The body of the pulpit on each cant is carved with "linen-fold" panels, save in the centre; where, in a niche, is a sculptured statuette, representing St. John the Evangelist bearing a scroll, and having an eagle by his side. The cornice around the top of the pulpit is carved and embattled. The addition to the church is the work of Mr. Harry Hems, of Exeter.

NEW FREE CHURCH, BRAID-ROAD, EDINBURGH.— The foundation-stone of the new Free Church to be erected at the corner of Braid-road and Cluny-drive, in the Morningside suburb of Edinburgh, was laid on the 22nd inst. The church, which has been designed by Dr. Rowand Anderson, is in the pointed Gothic style of architecture, will seat 800 persons, and will cost about £8,500. The builder is Mr. Mekie.

MISERERE, ST. JOHN'S CHURCH, TORQUAY.—At St. John the Evangelist's Church, Torquay, an addition has just been made to the oak choir stalls, which have done duty in the chancel ever since it was built from the designs of the late Mr. Street, more than twenty years ago. In these stalls no distinct accommodation was made for the officiating priest, and a priest's seat, with carved standards, and a raised desk for his use has just been placed upon the south-west end of the stalls. The seat can be turned up or down, and on its under side it is carved, the subject being a pelican feeding her young. On each side is conventional foliage, carved in the thirteenth-century type of architecture. The work has been executed by Mr. Harry Hems, of Exeter.

NEW MISERERES, ST. NICHOLAS'S CATHEDRAL, NEWCASTLE.—One of the last additions made to the Cathedral Church of St. Nicholas, Newcastle, are the misereres placed in the twenty-six canons' stalls within the altar rails. The designs have been carried out by Mr. Ralph Hedley.

NEW CHAPEL AT FISHLAKE, DONCASTER.—A new Primitive Methodist Chapel at Fishlake was formally opened on the 22nd inst. Accommodation is provided for a congregation of 160 at present, but this accommodation will be capable of extension. The architect was Mr. Howdill, of Leeds, the builder being Mr. E. G. Duckitt.

NEW CLOTHING FACTORY, LEEDS.—A new clothing factory, supposed to be one of the largest in the world, has just been opened at Leeds. The new factory, which has been built for Messrs. J. Hepworth & Son, stands at the entrance to Claypit-lane, on the Woodhouse-lane side. It forms an oblong square, 80 yards in length, and half that extent in width; while the three floors and the basement give a total floor space of 100,000 square feet. The new building has been designed by Mr. H. A. Cheers, of Twickenham. The contracts have been carried out by Messrs. John Wood & Son, builders; Messrs. Tomlinson & Sons, carpenters and joiners; Mr. Heavyside, slater; Messrs. Dearden Bros., painters; and Mr. Woffendin, plumber, all of Leeds. Messrs. T. Beecroft & Co. were the engineers. Nearly two thousand tons of timber have been used, and over one hundred miles length of scaffolding and floor boards. The facade of the structure fronts to Claypit-lane. The vestibule, paved in mosaic, leads on the left to the general office, where the windows have insertions of cathedral glass, and the woodwork is of mahogany and pitch pine. At the Grove House-lane corner is the workpeople's entrance, with timekeeper's-office. On the left side of the square is the packing-room. The stock-room adjoining has a length of 82 yards. Outside is space to be covered by dwellings for the staff. On the first floor is the tailoring department. The second floor, lighted from the roof, as well as by side windows, has accommodation for a thousand sewing machinists as well as shops for the mechanics. Close by are the pressing-rooms. The workrooms are heated by apparatus by Messrs. Dawson & Co., Limited, Stalybridge, and a white glazed-brick dado has been adopted for the purpose of cleanliness. In the basement, among other apartments, is the dining-room.

SANITARY AND ENGINEERING NEWS.

WATER SUPPLY OF BIRMINGHAM.—The Water Committee of the Birmingham City Council have just now under their consideration a scheme for making an entirely new source available for the water supply of the city. At the October meeting of the Council the committee were authorised to consult with Mr. James Mansergh, C.E., or failing him some consulting engineer, as to the further powers to be obtained by the Corporation with reference to additional works and sources of supply to meet future requirements. In December, Mr. Mansergh attended a meeting of the Water Committee, and subsequently he again consulted with them, and made a verbal report on the scheme which he considered most advisable for them to adopt. This scheme, the *Birmingham Daily Gazette* understands, is a most extensive one, as it involves the tapping of a supply in the centre of Wales. A scheme of this character was recommended to the Corporation by Sir Robert Rawlinson, C.E., as far back as 1871. He recommended that water should be taken from the Rivers Elan and Claerwen in Mid-Wales at an elevation of 900 ft. above the sea level, and should be brought to Birmingham by conduit, supplying other towns on the way. On November 25, Mr. Mansergh, accompanied by Mr. J. W. Gray (the Waterworks Engineer), and by Mr. J. G. Symons, of London, paid a visit to Rhayader to inspect the lower valleys of the Wye and Elan, and traversed an area of nearly 100 square miles of the various watersheds of the district so as to form an idea of its capacity as a collecting ground, if it should be decided to resort to it. Rhayader is about eighty miles from Birmingham, and any scheme for obtaining water from that locality would require to be sanctioned by an Act of Parliament. The reservoir would, in all probability, be situated in the valleys of the Elan and Claerwen. The line of pipes or conduit would probably cross through Radnorshire from near Rhayader to Cross Gates, from thence in the direction of Llanbister and Knighton, afterwards following the general line of the Central Railway Company to Craven Arms, and straight to Birmingham. On the 11th inst., Mr. Mansergh presented a written report to the Water Committee. After some discussion upon it, the Committee adjourned for a fortnight, when it is expected they will be able to come to some decision on the matter, and present a report to the City Council containing their recommendations on the scheme.

NEW WATER SUPPLY FOR COLWYN BAY.—Steps are being taken to secure for Colwyn Bay, Denbigh, a new supply of water from Llyn Cowlyd, situated at an altitude of about 750 ft. on a branch of the Snowdonian range of mountains on the Carnarvonshire side of the River Conway. Considerable progress has been made, and the scheme of Mr. T. B. Farrington, Borough Surveyor of Conway, has been accepted, the expenditure involved being 21,000*l.* At a meeting of the Joint Committee just held, Mr. T. T. Marks, C.E., Clerk and Engineer to the Llandudno Improvement Commissioners, who had been engaged to make a report on Llyn Cowlyd, stated that the more he examined the scheme, the more certain he was of its success. It would, when completed, afford the finest water supply in North Wales.

STAINED GLASS AND DECORATION.

FOLKESTONE CHURCH.—The parish church of Folkestone has recently received another large addition to its decoration, the execution of which has occupied some weeks. The design takes the form of the "Tree of Jesse," occupying the entire east wall of the north transept leading into the Lady Chapel; it represents Jesse lying asleep, and rising from him is a tree bearing on its branches his descendants, figures of Kings of Israel, little short of life size, among delicate foliage work; the tree terminating with the Blessed Virgin and Child, St. Joseph, and Jacob his father. Two angels hold a dossal behind the Virgin, and three angels flying forward, beneath their feet bearing the text, "Of Whom was born Jesus who is called Christ." The whole has been designed and executed by Mr. Alfred O. Hemming, of London, who is the artist of the picture-painting and decorations throughout the nave, embracing the stations of the cross, which we illustrated in our issue of August 23 last year.

NEW WINDOW, COLTNESS CHURCH, NEWMAINS, N.B.—In this church there has just been placed a stained-glass window in memory of Mr. Arthur H. Houldsworth. The window is a two-light one, and consists of four panels, each typical of an act of mercy. The design is by Mr. Stephen Adam, of Glasgow.

FOREIGN AND COLONIAL.

FRANCE.—M. Meissonier's health has prevented his retaining the presidency of the Société Nationale des Beaux-Arts, and he has delegated his office to M. Puvis de Chavannes.——The resignation of M. Antonin Proust as President of the Union Centrale des Arts Decoratifs is also announced. This step has arisen out of a difference of opinion in the Society in regard to the possession of the Palais des Beaux-Arts on the Champ de Mars.——M. Joseph Felon has been nominated by the Minister of Public Instruction as Professor of Decorative Composition at the National School of Decorative Art at Nice, and M. Corbel has been appointed Professor of Sculpture at the National School of Decorative Art.——Madame Spitzer, widow of the celebrated collector, has given to the Louvre Museum a reliquary of the fourteenth century, in rock crystal and adorned with enamels. It is Spanish work, with the arms of France, Anjou, Aragon, Castile, and Léon. It will be exhibited in the Galérie d'Appollon shortly.——A committee has been formed to erect at Gennevilliers, where the Paris sewage effluent is now in use for agricultural purposes, a monument to Alfred Durand-Claye, the engineer to whom the recent sanitary works in Paris are chiefly due.——A statue of General Faidherbe is to be erected at Bapaume, the sculpture by M. Louis Noël and the architectural portion by M. Georges Debrie.——The Jury on the competition for a Theatre at Saint Nazaire have pronounced judgment on the 17 competitive designs. The first premium has been given to M. Pierre Pecaud of St. Nazaire, the second to MM. Deperthes et fils of Paris, the third to MM. Bergon of Paris and Mardion of Tours.——The Société Académique of Lyons has given judgment on the various competitions of 1890. In architecture a gold medal has been given to M. Puchianti of Lyons, and an honourable mention to M. A. Garnier of Paris. For the archæological competition, M. Paul Porte of Lyons has obtained a gold medal.——A competition has been opened at Commercy for the establishment of water supply works for that town.——A new Lutheran Church has just been inaugurated at Neuilly-sur-Seine.——The Cercle Artistique et Littéraire of the rue Volney opened its annual exhibition on Monday last.——A new free architectural atelier is opened under the title of the Atelier Wable. Pupils preparing for the École des Beaux-Arts are admitted there.——The Ministry of Public Works has in preparation two décrêts the object of which is the re-organisation of the Conseil Supérieur des Bâtiments Civils.——A fire has done serious injury to the Hôtel de Ville of Havre, a pretty Renaissance edifice built in 1855 by Brunet-Debaines.——M. Nicholas Soultanoff, Professor of History and Architecture at the Institute of Civil Engineers of St. Petersburg, has been giving, at the Society of Antiquaries at Paris, an exceedingly interesting lecture on Russian Art and the characteristics of its different epochs.——Fifty years ago the celebrated Russian painter Alexis Bogoluboff, having quitted the navy in which he was then an officer, entered the École des Beaux-Arts as a pupil; he gained the Prix de Rome four years after, and has since obtained many successes both in France and Russia. The Russian colony in Paris has given a fête to celebrate his artistic jubilee, at which the Russian Ambassador and all his staff were present.

SWEDEN.—The Stockholm Academy of Fine Arts invites Swedish architects to compete with designs and plans for a new building. One prize of 2,000 kr., one of 1,500 kr., with an additional 500 kr. for purchase, are offered.——The Municipality of the town of Malmö has adopted the same regulations for the erection of buildings as those recently framed by the Stockholm Building Board, at the time quoted in our columns.——Herr P. A. Lindahl, civil engineer, has returned from a visit to the latest Continental theatres, undertaken at the expense of the syndicate building the opera house in Stockholm, for the purpose of studying their construction, ventilation, lighting, and safety arrangements. He considers that the most perfect in every respect are the Hofburg Theatre in Vienna and the two new theatres in Prague and Budapesth. These will, therefore, be taken as models for the new Swedish house. He found German and French theatres far behind the former. Even at the great Paris Opera House there is no iron curtain, only one of woven steel wire, which would permit smoke to pass through. Nor do the seats in the stalls lift up, and the electric light leaves much to be desired. The Stockholm Opera House is estimated to cost 220,000*l.*, a very large sum considering this city has only some 250,000 inhabitants.——A case of jerry building has just occurred at Stockholm, the entire fabric of a dwelling in course of construction suddenly collapsing. Fortunately, no one was on the premises at the time. It appears that the regulations laid down by the Building Board as regards the strength and erection of the iron columns and balks had been ignored, in consequence of which the builder and the owner are to be prosecuted. Swedish journals consider that the catastrophe again proves the necessity for stringent building laws.——A Swedish journal also draws attention to the careless manner in which the estimates were prepared by the city architect for two new public schools just completed. In one case the cost has exceeded the estimate by 7,500*l.*, and in the second by nearly 9,000*l.*——A sample office of Swedish manufactures is to be established at Rio de Janeiro, similar to the one at Buenos Ayres. Specimens of wooden villas, which are finding much favour in South America, are to be shown, as well as building timber, planed wood goods, iron, &c. It is curious that, although wood is so cheap in Sweden, only a single thoroughfare in Stockholm, the Vasobro, is laid with this material, which has lasted ten years. As several thoroughfares are to be relaid with stone or asphalte, the *Aftonblad* urges the use of wood instead, as in other capitals of late years.——The Eefdals porphyry quarries, whence some of the handsomest stone found in Sweden is obtainable, are to be reworked after some years of disuse.——A municipal electrical station is to be established in Stockholm at a cost of 75,000*l.*——Attention is drawn in an insurance journal to the dangers from fire in wood-pulp factories through the manner in which they are constructed.

DENMARK.—The last number of the official Danish *Gazette* contains an exhaustive report of some tests carried out in 1889-90, with samples of native mortar, under the direction of the Minister of the Interior.——The report of the Copenhagen Building Association of workmen is very favourable. It now numbers 16,372 members, and has erected since its formation 812 dwellings, in which over 7,000 persons reside. In addition, a sum of 16,000*l.* has been expended on land for 420 houses more.——The estimated cost of the new "free port" to be constructed at Copenhagen by the Government has been reduced to 555,000*l.* A company with a capital of 220,000*l.* is to work the concern.——A company has been formed for working the valuable granite quarries in the island of Bornhalm, and to construct a port for exporting the stone. Some 800 hands will be employed.

TOKIO.—The provisionary Japanese Houses of Parliament buildings, which were only opened November 29 last, have been destroyed by fire. The block, covering 4,000 square mètres of ground, with a frontage of 110 mètres, had been erected according to the designs of Messrs. Ende & Boeckmann, of Berlin, under the direct supervision of Professor Ende. The building destroyed was a half-timber one, two stories high, showing but little attempt at decoration. Its cost was 20,000*l.* The halls of both Upper and Lower "Houses" had some 350 seats each, placed in semi-circular rows.

HALLE.—The historical old castle, the Moritzburg, now in ruins, is to be restored, and the halls to be used as drill-halls and gymnasiums and the chapel for the Church-examination purposes. The castle was commenced 1484, the chapel 1509.

CHINA.—A new hotel, "The Austen Arms," has been built on the Hong Kong Mountain, 1,500 ft. above the level of the sea. All materials required had to be carried up on the backs of coolies. The building is constructed of red bricks and stucco, with columns, capitals, &c., of granite. The roof is covered with red Chinese tiles, and the floors of the balconies and corridors laid with patterned tiles and red bricks. All the woodwork on the first floor is of Indian teak, and in the upper ones of hard Singapore wood and Chinese fir. The walls of the great assembly room are supported by iron columns and dragons' heads manufactured by Messrs. H. Young & Co., of Pimlico. There are besides a great dining-room, reading and smoking-rooms, as well as private dining and sitting-rooms, and about sixty bedrooms. All the latter have a separate bath-room attached. The building work has been carried out entirely by Chinese, the architects being Messrs. Danley, Leigh, & Orang, of Hong Kong. The cost has been 25,000*l.*

RANGOON CATHEDRAL.—There are prospects of this structure being pushed on towards completion. The building was started some five years back—the foundation stone being laid by Lord Dufferin during his visit to Burma, and after being raised some 18 ft. the works were stopped for want of funds. Sanction has now been obtained from the Government of India to demolish the old Pro-Cathedral on the strand and to sell the material and lands for the purpose of raising funds to meet expenditure on the new works. Most of the decorative items have been purchased and are now lying at the works, and it is to be seen how long more the Protestant public will have to wait for this long-promised edifice (specially designed by Mr. Chisholm) to become an accomplished fact. The Catholic ecclesiastics appear to have a better system in regard to building churches. The cathedral begun in Mandalay some two years after the former is almost completed. — *Indian Engineering.*

BERLIN.—At a well-attended meeting of the "Architekten Verein," on Monday last, Professor F. Adler gave a lecture on Dr. Schliemann's life and the results of his excavations. In the course of the lecture, the Professor showed a very exact knowledge of the Schliemann work; he is an enthusiast as to his achievements, and strongly opposed to Captain Boettcher's ideas of the discoveries, which he treated with sarcastic contempt.——Berlin's first monument to the memory of Emperor Frederick III. has been unveiled; its situation is in front of the head police offices.——The competition for the design of a memorial monument to Emperor William I., to be erected at Frankfort-on-the-Maine, has been decided, the jury awarding three equal prizes (of 200*l.* each) to Messrs. Maison & Romeis (Munich), Buscher (Duesseldorf), and Werner Stein (Leipsic). Fifty-one designs had been sent in: some of the best, however, had to be excluded for infringement of the conditions.——A fire, which might have been of serious consequence to the progress of the new Houses of Parliament, in course of erection, broke out at the Government Drawing Offices situated on the site, but was luckily extinguished without loss of a single drawing. The fire-brigade, which feared a spreading of the fire to the scaffolding of the block (insured at 200,000*l.*), mustered in great force, but were scarcely required. ——The sudden thawing of the snow (which had been left in the roadways for sledging purposes) whilst the gullies are still frozen, has caused great inconvenience. In some streets the water stood 6 in. to 18 in. deep, and many cellars are flooded.

MISCELLANEOUS.

THE NATIONAL REGISTRATION OF PLUMBERS.—The *British Medical Journal*, in commenting upon the movement for the education, examination, and registration of plumbers, says:—"The President of the Local Government Board has set the seal of his official approval upon the movement, and many of the leading municipalities now require that persons engaged in plumbing work on their behalf shall hold a certificate of registration of the Plumbers' Company, implying efficiency. The time must now surely be near at hand when the further step may be taken to complete the scheme to give the sanction of an Act of Parliament to the register, and to give the required protection to the public by protecting the title of registered plumber, so that none others shall assume it than those who have been duly examined and certified. Meantime it is highly satisfactory to see that public opinion has been sufficiently energetic, and the trade sufficiently enlightened, to lead to so large an amount of voluntary registration."——At Sunderland, on the 26th inst., the Mayor presided over a crowded public meeting held in the new Municipal Buildings. Professor Garnett, principal of the Durham University, delivered a lecture on "Modern Sanitary Appliances," and gave a series of limelight illustrations of defective apparatus met with in several typical houses. Referring to the technical and scientific education of plumbers, Professor Garnett said there was nothing so well calculated to develop habits of thought as oral class teaching, in which the students were called upon to point out defects in appliances sketched on the blackboard, and to give their reasons for considering the apparatus defective. On the motion of Dr. Harris, Medical Officer of Health, the following resolution was passed:—

"That this meeting desires to record its opinion that it is essential to the health and comfort of all classes of the community that the plumbers' craft should be brought under such regulation and control as to ensure the efficient training of its members, and that this can be best effected by the system of national registration, which requires plumbers to pass qualifying examinations; and that the meeting further desires to direct the attention of Parliament to the necessity for legislative enactments to effect these objects."

DOCKS IMPROVEMENTS AT BRISTOL.—The Bristol Docks Committee had under consideration, at their meeting on the 12th inst., a report from the Engineer relating to matters connected with the practical working of the Dock Estate. These included, amongst others, a new system of dredging by means of hydraulic jets; alterations to the 35-ton crane on the Harbour wharf; and the provision of hydraulic cranes on the city quays. Ultimately the committee resolved to report to the Council in favour of providing a system of hydraulic cranes round the city quays, at an estimated cost of about 4,000*l.* With regard to the proposed alteration to the 35-ton crane on the Harbour wharf, it was resolved not to undertake the work at the present time. The plan of hydraulic dredging by Tydeman's system was approved.

ROYAL VICTORIA HALL.—The following arrangements are announced for science lectures at the above Hall:—February 3—"From Dry Bones to Useful Material," by Mr. Ward Coldridge; February 10—"Plants and Animals of the Coal," by Professor H. G. Seeley; February 17—"Our Chalk Hills," by Mr. F. W. Rudler; February 24—"A Trip to New Zealand," by Professor Hall Griffin.

A GIGANTIC BUILDING.—The foundation-stone has just been laid of an immense building at Cook, in the United States, on the corner of State and Randolph-streets. The structure will be 275 ft. in height, and contain twenty stories, the cost being estimated at about 445,000*l.* To give an idea of the size and requirements of the building, it may be mentioned that the elevators are calculated to carry 45,000 persons a day. The building is intended chiefly for business purposes, and is to be finished by the middle of next year.

THE DEMOLITION OF THE SCARBOROUGH "BAR."—A correspondent writes to the *Leeds Mercury*:—"Now that the demolition of the 'Bar,' the structure situated in the main thoroughfare of Scarborough, which was erected in 1843 in replacement of a very ancient bar and prison on the same site, and which has long proved an obstruction to traffic in this busy part of the town, is an accomplished fact, and the demolition of the adjacent shops and offices is in active progress, the immense value of the improvement, when fully completed, may be gauged. The total width of the road and pathways will be increased from 25 ft. 9 in. to 50 ft., and this will extend for 82 ft. Moreover, within a few yards' distance an hotel, one of the largest in Scarborough, is being erected on the site of the old Bull Hotel, and at the corner of Huntriss-row (opposite) the London and Yorkshire Banking Company are having premises built. Each structure is in the Flamboyant style of architecture. The whole appearance of this particular part of the town has been changed, and a great surprise awaits those forthcoming visitors who had become familiar with the old order of things."

THE SOUTH LONDON ELECTRIC RAILWAY.—At the evening meeting of the Inventors' Institute on January 14, Mr. C. E. Spagnoletti, the electrician of the Great Western Railway, gave an account of the electric locking and block system, in use on the South London Electric Railway. The description was the more interesting that it was illustrated by a full set of levers and instruments representing the details of two actual stations and the intermediate section of railway line guarded by this electric block system. The normal position of the levers and the signals is at danger; and in this position each of the levers is locked by a plug worked by the electric current. Thus the train cannot enter the guarded section whilst the signals are against it. Before the signalman at the entering station can release his signal, he must ask, by bell message, the signalman at the station in advance to liberate the lock. If the section is clear, the advance signalman will send an electric current from the instrument in his cabin, and unlock the applicant's lever, who then lowers his signal, lets the train through, and puts his lever back to its normal position. He cannot let another train follow, because the lever of his signal is locked. Neither of the signalmen can now move their levers until the train has reached the end of the guarded section of the line, when it passes over a tripper connected to the rails, and which automatically sets the current instruments. Every fresh action of a signalman necessitates, in the first place, a bell-message to a second signalman; secondly, an electric unlocking current transmitted from the advance signalman; and thirdly, the automatic setting of the electrical instruments of current transmission. These safeguards provide against human errors. No signalman can act under any misapprehension, because another signalman controls him; and the two men cannot concurrently commit an error, because neither can act at all until the train itself has cleared the means of working the signals by its own final performance in passing the end of the guarded section of the railway. No two trains can, therefore, run on the guarded section at the same time. Should any derangement of the electric instruments take place, the safety of the system is not affected, because the derangement locks up everything in the normal position of danger warning. The line can then, under the guidance of the inspector, or other authorised officer, be worked in the ordinary mechanical way. This electric system is in use on several lines, and working most satisfactorily. The very intricate crossings of railways at King's Cross Junction, where the Great Northern and Midland trains pass athwart the main lines of the Metropolitan Railway, are protected by this system in a most efficient manner, allowing the trains to pass with a rapidity of succession unattainable by any other means. The meeting was largely attended by railway officials and electricians, and the subject elicited very great interest.

THE INTERNATIONAL CONGRESS OF HYGIENE.—Sir George Harris, L.C.C., Mr. H. H. Collins, F.R.I.B.A., and Mr. Mark H. Judge, A.R.I.B.A., have been elected to represent the Paddington Vestry at the International Congress of Hygiene.

THE ASSOCIATION OF PUBLIC SANITARY INSPECTORS OF GREAT BRITAIN.—The eighth annual dinner of this Association will be held at the Holborn Restaurant, on Saturday, February 7, Dr. B. W. Richardson, F.R.S., &c., President, in the chair.

ST. PAUL'S ECCLESIOLOGICAL SOCIETY.—The annual meeting of this Society will be held at the Chapter House, St. Paul's Churchyard, this Saturday, January 31, at 2.30 p.m.

THE SOCIETY OF ENGINEERS.—The first ordinary meeting of this Society for the year 1891 will be held on Monday, February 2, at the Town-hall, Westminster. The President for the past year, Mr. Henry Adams, will present the premiums awarded for papers read during the year, and the President for the year 1891, Mr. William Newby Colam, will deliver his inaugural address.

THE WHITECHAPEL CRAFT-SCHOOL.—We have received a prospectus of a handicraft school established under this title at 27, Little Alie-street, Whitechapel. Mr. T. Eadie Reid holds a class in practical decoration on Wednesday evenings at 8, and Mr. A. J. Dymott a class in carving and modelling on Friday evenings at the same hour. The first-named classes are specially intended to meet the needs of lithographic draughtsmen, sign-painters, house-decorators, &c., and the class of carving for wood-carvers, cabinet-makers, stone-masons, sculptors, &c. Both men and apprentices are invited to join. The hon. secretary is Mr. Llewellyn Smith.

SANITARY PROGRESS IN INDIA.—One of the results of the recent high death-rate in Madras and the agitation that ensued has been the formation of a Public Health Society, which held its inaugural meeting a few days ago. The address, which was read by Surg.-Major W. G. King, Deputy Sanitary Commissioner, was a model of common-sense, and should be printed by Government and distributed to every district and municipal officer throughout the length and breadth of India. He premised by pointing out the very limited extent to which Government could at present influence sanitation in the country. The Sanitary Board, consisting of the Sanitary Commissioner and the Engineer, assisted by district medical and sanitary officers, can bring a certain amount of influence to bear on local bodies, but is incapable, both from the absence of the necessary legislation and of the necessary staff, to enforce its advice. The speaker, however, thought we might look forward to the time when "a large and skilled staff of medical and sanitary officers, engineers, and nuisance inspectors, supported by well considered laws, would be responsible for the investigation and prevention of disease throughout the Presidency." He admitted that such a centralisation of authority would not be in accord with the present principles of the administration of the country and the encouragement of local self-government, but maintained that "until every member of a local body is capable of giving an opinion founded upon special education as to the merits of sanitary and engineering advice, it must seem at least reasonable that their discretion should be subject to skilled control." The existence of such a department would not, however, conflict with the objects of the society now established, for, while it would be the duty of the former to labour in producing elaborate schemes for water-supply, drainage, conservancy, and the structure of dwellings and towns, it would be the province of the latter to aid in combating disease, the result of individual ignorance or apathy, and with this object the society should include members resident in all parts of the mofussil.—*Indian Engineer.*

COMPETITIONS, CONTRACTS, AND PUBLIC APPOINTMENTS.

COMPETITIONS.

Nature of Work.	By whom Advertised	Premium.	Designs to be delivered.
Free Public Library	Brechin Town Council	Not stated	Feb. 16
Methodist Chapel, Newton Heath, Manchester	W. Haddocks	do.	No date

CONTRACTS.

Nature of Work or Materials.	By whom Required.	Architect, Surveyor, or Engineer.	Tenders to be delivered.
*Fire Escape	Barnsley Union	*Official*	Feb. 2
Bridge Ironwerk	Madras Railway Co.	do.	Feb. 3
Steel Rails, Fishplates, &c.	India Office	do.	do
Street Improvement Works	Bootle Corporation	do.	do.
Additions to New Inn Hotel, Pontypridd	.....	E. M. Bruce Vaughan	do.
*Works and Materials	Westminster Vestry	G. R. W. Wheeler	do.
*Roadmaking Works	Tottenham Local Bd.	J. E. Worth	do.
*Cast-iron Water-pipes	Brampton U.R.S.A.	J. Reay	Feb. 4
*Road Materials	Hull Corporation	*Official*	do.
*Works and Materials (one year)	Hampstead Vestry	C. H. Lowe	do.
Alterations to Police Station, Willert-st.	Manchester Corp.	*Official*	do.
Timber of various kinds	Admiralty	do.	do.
Wrought Ironwork for Bridge	Belfast Corporation	do.	do.
Two Houses, Horsforth, Leeds	.....	C. F. Wilkinson	do.
Villa Residences, Gloucester	.....	J. Fletcher Trew	Feb. 5
Three Cottages, South-street, Carlisle	Wilson Buckle	.....	do.
Iron Ash-boxes, &c.	Bristol U.S.A.	*Official*	do.
*Battery and Drill Shed, Greenock	Admiralty	do.	Feb. 6
Main Brick Sewer	Sheffield Corporation	G. Alsing	do.
Additions to Business Premises, Craghead, Chester-le-street	.....	J. W. Rounthwaite	do
Paving Works	Stamford U.S.A.	J. Richardson	do.
*Building Works	M. R. Co.	*Official*	do.
Enlargement of Works and Foundry, Halifax	.....	T. Lister Patchett	Feb. 7
Impounding Reservoir, &c. near Waterfoot, Newchurch	Bury Corporation	J. Cartwright	do.
Cement (200 tons)	Warrington Twn Coun.	T. Longdin	Feb. 9
*Supply of Road Materials	Com. of H.M. Wks, &c.	*Official*	do.
*Erection of Public Conveniences	LondonCountyCouncil	do.	do.
*Purchase and Pulling-down Building Mat.	School Bd. for London	do.	do.
*New Hospital, North Heigham	Norwich Corporation	P. P. Marshall	Feb. 10
*Works and Materials	Battersea Vestry	J. T. Pilditch	do.
*Building a Weir, &c. &c.	LondonCountyCouncil	*Official*	do.
*Alterations and Additions to Boiler-house Sewerage Works, Flushing Tank, &c.	do.	do.	do.
Wooler	Glendale Union R.S.A.	do.	do.

CONTRACTS.—*Continued.*

Nature of Work or Materials.	By whom Required.	Architect, Surveyor, or Engineer.	Tenders to be delivered.
Brick Gasholder Tank	Congleton Corporation	T. Newbigging	Feb. 10
Church, Lecture Hall, &c. Portadown, Ireland	Committee	Young & Mackenzie	do.
*Silicated Stone Pipe Fewer	East Ham Local Board	W. H. Savage	do.
*Additions, &c. to Eastern Fever Hospital	Met. Asylums Board	Keith D. Young	Feb. 11
Fifty Houses, Aberdare Junction	Ynysfeirig Build. Club	A. O. Evans	do
Office and Workshop, Oakham	RutlandCountyCouncil	J. Richardson	do.
Paving, Flagging, &c.	Castleford Local Board	*Official*	do.
Gasholder Tank	Hartlepool Gas and Water Co.	Thos Bower	do.
*Alterations and Repairs to Houses	LondonCountyCouncil	*Official*	Feb. 12
*Purchase and Removal of Old Metal	do.	do.	do.
*Alterations, &c. Bournemouth Post-office	Com. of H.M. Wks, &c.	do.	Feb. 13
*Roadmaking Works, &c.	Sevenoaks Local Board	Jabez Mann	do.
*Removal of Road Sweepings, &c.	St. Pancras Vestry	W. B. Scott, C.E.	Feb. 16
*Supply of Road Materials, &c.	do	do.	do.
*Broken Granite, Granite Siftings, and Flints	Dover Town Council	*Official*	Feb. 17
New Boiler and Alterations at Infectious Diseases Hospital	Portsmouth U.S.A.	do.	do.
New School, Southsea	Portsmouth Sch. Bd.	C. W. Bevis	do.
*New Municipal Buildings	Sheffield Corporation	E. W. Mountford	do.
*Alterations and Additions to Infirmary	Salisbury Infirmary	J. Harding & Son	Feb. 20
*New Cemetery	Willesden Burial Bd.	C. H. Worley	Feb. 21
*Police Station and Lock-up House	Breconshire C. C.	*Official*	do.
*Hospital Pavilion, Additions, &c.	Wolverhampton Corp.	do.	Mar. 3
Waterworks (large contract), Nenagh, Ireland	Guardians	Gill & Son	Mar. 5
*Works and Repairs to Public Buildings in London	Com. of H.M. Wks, &c.	*Official*	do.
*New Bank Premises, Cambridge	Messrs. Foster & Co.	A. Waterhouse	No date
Alterations and Enlargement of Church, Knarsdale, Newcastle-on-Tyne	.....	Hicks & Charlewood	do.
Additions to Hospital, Sheffield	Sheffield Corporation	J. D. Webster	do.
*New Buildings, Skeerness-on-Sea	.....	W. M. L. Seaman	do.

PUBLIC APPOINTMENTS.

Nature of Appointment.	By whom Advertised.	Salary	Applications to be in
*Inspector of Nuisances	Hanley Corporation	104*l.*	Feb. 3
*Temporary Clerk of Works	Fulham Vestry	2*l.* 2*s.*	Feb. 12

Those marked with an Asterisk (*) are advertised in this Number. *Contracts, pp.* iv., vi., *and* viii. *Public Appointments, p.* xx. *and* xxi.

"BULIMBA," SEVENOAKS.—We are asked to mention that in this house, illustrated in the *Builder* last week, the windows were all fitted with Hope's steel casement frames.

LIVERPOOL ENGINEERING SOCIETY.—On Wednesday, January 21, a large number of the members of this society paid a visit of inspection to the Central Station of the Liverpool Electric Supply Company in Highfield-street, Liverpool. On the arrival of the party at the works, they were met by Mr. A. Bromley Holmes, M.Inst.C.E., the Engineer to the Company, who personally conducted them through the station, and explained the nature and working of the machinery and appliances there in operation for the supply of electricity for lighting and other purposes. Later in the evening, the fifth ordinary meeting of the session was held at the Royal Institution, Colquitt-street, Mr. James Morgan, Vice-President, in the chair, when a paper was read by Mr. A. Bromley Holmes, descriptive of the works of the Liverpool Electric Supply Company. An interesting discussion followed, and a vote of thanks to Mr. Holmes terminated the proceedings.

THE ENGLISH IRON TRADE.—While there has been a partial recovery in the English iron market, and its tone is slightly stronger, it cannot be said that there is much more business stirring. Enquiries for pig-iron are becoming more numerous, but sellers are not very eager to effect sales, urging that, with fuel and wages high, they will be losers by any arrangements they may make for forward deliveries at present rates. It is expected that when, with more open weather, shipments grow, a rise in values may follow. Scotch warrants have been tolerably steady during the week, and Cleveland pig shows a slight rise, but hematites are weaker. Although there is here and there a little more demand for finished iron, prices do not improve, the tendency being rather the other way. There is not much doing in steel, with prices cut very fine. Shipbuilding is quiet, but engineers continue fairly active.—*Iron.*

LEGAL.

LIBELLING A SURVEYOR.

HISCOCKS *v.* HARRIS.

THIS case, tried in the Queen's Bench Division on Wednesday last, before Mr. Justice Grantham and a common jury, was an action to recover damages for a slander uttered on March 10, 1890, at a meeting of the Vestry of St. George-the-Martyr at Southwark, to which body the plaintiff is Surveyor, and of which the defendant was at the time a member. There was a meeting summoned by the members of the Board on that day for the purpose of reorganising the Surveyor's department, and the plaintiff complained of the following words as spoken by the defendant:—"It was a dishonest transaction and a shameful piece of jobbery on the part of the Surveyor (meaning the plaintiff) to certify the amount, and the Surveyor (the plaintiff) should be called upon to resign," meaning that the plaintiff was a dishonest man and unfit to hold the post of Surveyor.

The case for the defendant was that he was actuated by a desire to protect the ratepayers' pockets, and that the expenses of the Surveyor's department had been excessive, especially in the items of the sharpening of tools and buying new ones, and altering a shed into a smithy, that the Vestry might do their own sharpening on the premises.

The jury found a verdict for the plaintiff, damages 150*l.*

His Lordship gave judgment accordingly, and refused a stay of execution.

MEETINGS.

SATURDAY, JANUARY 31.

Royal Institution.—Mr. W. Martin Conway, M.A., F.S.A., on "Pre-Greek Schools of Art." II. 3 p.m.

St. Paul's Ecclesiological Society.—Annual Meeting, 2.30 p.m.

MONDAY, FEBRUARY 2.

Royal Institute of British Architects.—(1) To receive the announcement of the name of the person the Council propose to submit to her Majesty the Queen as the recipient of the Royal Gold Medal. (2) Paper by Baron Henry de Geymüller on "The School of Bramante and its Expansion throughout Italy and the rest of Europe." 8 p.m.

Surveyors' Institution.—Adjourned discussion on Professor J. Wrightson's paper on "The Basis of the Cost of Wheat-growing." 8 p.m.

Society of Engineers.—The President, Mr. W. N. Colam, will deliver his Inaugural Address. 7.30 p.m.

University College (Archæology).—Mr. W. St. Chad Boscawen on "Babylonian Archæology and Art." III. 5 p.m.

Clerks of Works' Association (Carpenters' Hall).—Monthly Meeting. 8 p.m.

Royal Institution.—General Monthly Meeting. 5 p.m.

Victoria Institute.—Mr. W. St. Chad Boscawen on "Recent Results of Babylonian Archæology." 8 p.m.

Society of Arts (Cantor Lectures).—Mr. A. J. Hipkins, F.S.A., on "The Construction and Capabilities of Musical Instruments." II. 8 p.m.

Liverpool Architectural Society.—Mr. E. P. Warren, on the "History of the Hearth." 7 p.m.

TUESDAY, FEBRUARY 3.

Institution of Civil Engineers.—Messrs. Llewelyn B. and Claude W. Atkinson on "Electric Mining Machinery." 8 p.m.

Sanitary Institute (Lectures for Sanitary Officers).—Mr. H. Law on "Principles of Calculating Areas, Cubic Space, &c.: Interpretation of Plans and Sections to Scale." 8 p.m.

Society of Biblical Archæology.—(1) Paper by the President, Mr. P. le P. Renouf. (2) Mr. B. T. Evetts on "The Canephoros in Early Chaldean Art." 8 p.m.

Manchester Architectural Association.—Mr. H. Ross on "Houses for Working Men." 7.30 p.m.

Glasgow Architectural Association.—Mr. C. R. M'Intosh on "Scotch Baronial." 8 p.m.

WEDNESDAY, FEBRUARY 4.

South Kensington Museum (Lecture Theatre).—Mr. Maurice Hewlett on "The Rise of the Renaissance in England." V. 3.45 p.m.

Civil and Mechanical Engineers' Society.—Mr. Horatio Daniell on the "The 'Jerome' Steamship Shaft." 7 p.m.

St. Paul's Ecclesiological Society.—Mr. Andrew Oliver on "Brasses in City Churches." 7.30 p.m.

British Archæological Association.—(1) Mr. Andrew Oliver on "Brass Monuments in the Ancient Churches of London." (2) Mr. J. H. Macmichael on "Tradesmen's Signs of Old London." 8 p.m.

Society of Arts.—Mr. J. E. Dowson on "Decimal Coinage, Weights, and Measures." 8 p.m.

Liverpool Engineering Society.—Mr. J. Boult on "The Phenomena of Tidal Rivers." 8 p.m.

THURSDAY, FEBRUARY 5.

Royal Archæological Institute.—(1) The Baron de Cosson, on "Arsenals and Collections of Armour and Arms in South Germany and Austria." (2) Mr. G. M. Atkinson, on "Rubbings of Marks on Eastbourne Old Church." 4 p.m.

Institution of Civil Engineers.—Students' Visit to the Refrigerating Machinery at the Victoria Dock, E. 2 p.m.

Society of Antiquaries.—8.30 p.m.

FRIDAY, FEBRUARY 6.

Architectural Association.—Mr. J. M. Brydon on "The English Renaissance of the Eighteenth Century." 7.30 p.m.

Sanitary Institute (Lectures for Sanitary Officers).—Dr. Louis Parkes on "Water Supply: Drinking Water, Pollution of Water." 8 p.m.

Royal Institution.—The Right Hon. Lord Rayleigh, M.A., F.R.S., on "Some Applications of Photography." 9 p.m.

SATURDAY, FEBRUARY 7.

Royal Institution.—Mr. W. Martin Conway, M.A., F.S.A., on "Pre-Greek Schools of Art." III. 3 p.m.

Association of Public Sanitary Inspectors.—Annual Dinner, Holborn Restaurant. 6 p.m.

London Geological Field Class (Gresham College).—Professor H. G. Seeley, F.R.S., on "The Gravel Beds of the Thames and its Tributaries in relation to Ancient and Modern Civilisation." I. 4.15 p.m.

RECENT PATENTS:

ABSTRACTS OF SPECIFICATIONS.

2,509.—STOCKS FOR BORING-BITS: *J. Gutmann.*—The boring-bit is, according to this invention, held in the socket of the stock by means of a number of wedges moving in radial converging guide grooves formed in the socket. The wedges, being subjected to an equal degree of pressure, are caused to press with equal force against the boring-bit. The wedges are pressed along their guide grooves by means of a nut, and formed with a face adapted to press against the lower ends of the wedges. In the socket is a disc guided vertically by a pin and bearing against a spring, which constantly presses the wedges against the face of the nut. To fix a boring-bit in a stock of this construction, the socket from which the nut is unscrewed is inverted, when the wedges and the boring-bit will rest on the disc; the nut is then screwed on, when the disc will by means of the wedges be pressed downwards, which movement will be followed by the boring-bit until the wedges grip and jam it. To prevent the wedges leaving the groove sideways, they are formed partly flat, with an enlarged portion at the back which enters the groove.

2,021.—CUTTING OR SAWING STONE: *S. W. Dearden.*—In horizontal saw-frames it is claimed by this specification that an improvement is effected by fixing a vertical head in front of the machine at right angles to the saw-frame to which it is adjustably attached. The saws are better able to perform the sawing than when the end of the saw-frame is being constantly raised and depressed by the crank through the varying angles of the crank arm attached to the saw-frame in the ordinary method.

15,953.—CONVERTIBLE LADDERS AND TRESTLES: *J. H. Heathman.*—The main ladder which is the sub-

ject of this patent is made tapering to a wide base, and parallel grooved strips are fixed down behind the rungs; tongue-pieces are fixed to the lower part of the sliding ladder to travel in the grooves. The extension is controlled by a cord. A pair of horns are fixed to the main ladder, and carry a bolt which serves to guide and hold in position the sliding ladder; or the bolt can be withdrawn and passed through the horns and holes in the slide ladder to form a hinge upon which such sliding ladder may open out to support the main ladder, and therewith form trestles.

18,153-7.—DIES FOR ROLLED WOOD AND OTHER SCREWS: *C. D. Rogers.*—The improvements to which this specification relates are in the form of the dies, and in the arrangement of ribs and grooves for special patterns of rolled screws.

NEW APPLICATIONS FOR PATENTS.

January 12.—538, E. & E. Kerry, Burglar-cheater and Draught-excluder.—548, G. Lyons, Sliding Windows.—554, J. Burnett, Warming and Ventilating Buildings.—570, T. Davey, Metal-fencing.—575, J. Vaughan, Sliding-sashes.—591, E. Goupil, Construction of Houses and other Buildings.—592, T. Oliphant and others, Ventilators.—596, E. Wright, Fireplaces and Cooking-ranges.—599, A. Boult, Draught-excluders.

January 13.—631, C. Day, Supply Air to, and the Prevention of Smoke from Fireplaces.—659, J. Stidder, Water-closets, Urinals, &c.—665, W. Deeming, Sanitary-pipes, &c.—684, W. Astrop and F. Parker, Manufacture of White Lead.

January 14.—704, H. Dixon and H. Cohen, Veneering.—716, C. Vasmer, Ventilating and Heating Rooms.—725, R. Wünsch, Construction of Bridges.

January 15.—747, W. Redish, Fire-grates.—752, W. Mather, Imitation of Inlaid Woods.—757, A. Carns, Disinfecting Apparatus for Water-closets.—787, J. Russell, Stove-grates.—789, J. Gibson, Window Sashes and Frames.

January 16.—820, T. and J. Holt, Flushing Cisterns for Water-closets, &c.—832, J. Martin, Raising and Lowering Sash-windows.—839, A. Hunter, Sash Lifter and Fastener for Windows.

January 17.—900, W. Wade, Tiles.

PROVISIONAL SPECIFICATIONS ACCEPTED.

17,992,. W. Brown, Drawing Instrument.—19,260, C. & J. Smith, Wood-working Machines, especially applicable to chamfering and dovetailing and other sloped or bevelled work.—19,605, G. Abernethy, Draught Excluders for Doors, Windows, &c.—20,611, E. Lucas, Wall Decoration.—20,812, J. Sowden, Affixing Sash-lines to Window-frames, &c.—21,041, E. Allen, Erection of large Buildings suitable for Exhibitions.—21,187, A. Burlingham, Machinery for Bressing Bricks and Tiles.—21,192, E. Allen, Concrete Buildings, &c.—21,275, J. McGlashan, Valve for Preventing Down Draught in Chimneys, Ventilators, &c.—13, J. Sim, Fittings for Casement Windows, Doors, &c.—104, B. Oelrichs, Baker's Ovens.—277, A. Lees, Curing Smoky Chimneys, &c.

COMPLETE SPECIFICATIONS ACCEPTED.

Open to Opposition for Two Months.

608, J. Becker, Scaffolding.—3,887, W. Thompson, Ventilators.

SOME RECENT SALES OF PROPERTY:

ESTATE EXCHANGE REPORT.

JANUARY 19.—By *J. Baker & Son:* "Hall's Upper Wharf," Grosvenor-rd., Pimlico, u.t. 38 yrs., g.r. 222*l.*, r. 500*l.*, 2,005*l.*

JANUARY 20.—By *A. Chancellor:* 1, Vineyard Villas, Richmond, u.t. 23 yrs., g.r. 3*l.*, r. 35*l.*, 240*l.*—By *C. & H. White:* 140, Vauxhall Walk, Lambeth, f., 410*l.*; 38, Crozier-st., u.t. 41 yrs., g.r. 5*l.* 12s., r. 40*l.*, 500*l.*; 33, Foreign-st., Brixton, u.t. 74 yrs., g.r. 4*l.* 10s., r. 38*l.*, 300*l.*—By *Bean, Burnett, & Co.:* No. 366, Clapham-rd., u.t. 51 yrs., g.r. 12*l.*, r. 75*l.*, 725*l.*; No. 368, u.t. 51 yrs., g.r. 12*l.*, r. 80*l.*, 820*l.*

JANUARY 21.—By *A. J. Sutherland:* 75 and 77, Lillington-st., Westminster, u.t. 38 yrs., g.r. 10*l.*, r. 92*l.* p.a., 840*l.*

JANUARY 22.—By *Farebrother, Ellis, & Co.:* 67, Central-hill, Norwood, f., r. 20*l.*, 550*l.*; freehold stabling in the rear, r. 12*l.*, 170*l.*: 101, Central-hill, f., r. 40*l.*, 800*l.*—By *C. C. & T. Moore:* 34, Tredegar-rd., Bow, u.t. 72 yrs., g.r. 6*l.*, r. 32*l.*, 305*l.*

[*Contractions used in these lists.*—F.g.r. for freehold ground-rent; l.g.r. for leasehold ground-rent; i.g.r. for improved ground-rent; g.r. for ground-rent; r. for rent; f. for freehold; c. for copyhold; l. for leasehold; e.r. for estimated rental; u.t. for unexpired term; p.a. for per annum; yrs. for years; st. for street; rd. for road; sq. for square; pl. for place; ter. for terrace; cres. for crescent; yd. for yard, &c.]

PRICES CURRENT OF MATERIALS.

TIMBER.	£.	s.	d.	£.	s.	d.
Greenheart, B.G. ....ton	6	15	0	7	5	0
Teak, E.I. ....load	10	0	0	13	0	0
Sequoia, U.S. ....foot cube	0	2	3	0	3	0
Ash, Canada....load	2	10	0	4	5	0
Birch ,, ...	2	5	0	4	5	0
Elm ,, ...	3	10	0	4	15	0
Fir, Dantsic, &c....	2	0	0	3	15	0
Oak ,, ...	2	10	0	4	10	0
Canada	4	17	6	6	10	0
Pine, Canada red	2	10	0	3	10	0
,, yellow	2	0	0	5	10	0
Lath, Dantsic....fathom	5	0	0	6	0	0
St. Petersburg	5	0	0	7	0	0
Deals, Finland, 2nd & 1st. std. 100	7	10	0	10	0	0
,, ,, 4th and 3rd	7	0	0	7	5	0
Riga	6	0	0	8	0	0
St. Petersburg, 1st yellow	9	10	0	14	10	0
,, 2nd ,, ...	7	10	0	9	0	0
,, white	7	0	0	10	0	0
Swedish	7	0	0	15	10	0
White Sea	8	0	0	17	0	0
Canada, Pine, 1st	13	0	0	24	0	0
,, ,, 2nd	9	0	0	16	0	0
,, ,, 3rd, &c.	7	0	0	10	0	0
,, Spruce, 1st	8	10	0	10	10	0
,, ,, 3rd and 2nd ..	6	10	0	8	0	0
New Brunswick, &c.	5	10	0	7	10	0
Battens, all kinds	4	10	0	15	10	0

TIMBER *(continued).*	£.	s.	d.	£.	s.	d.
Flooring Boards, sq., 1 in., prepared, First	0	10	0	0	14	0
Second	0	8	0	0	10	6
Other qualities	0	5	6	0	7	9
Cedar, Cuba .... foot	0	0	4	0	0	5
Honduras, &c.	0	0	3½	0	0	4½
Mahogany, Cuba....	0	0	4½	0	0	6½
St. Domingo, cargo average ..	0	0	4½	0	0	6½
Mexican ,, ...	0	0	4½	0	0	5½
Tobasco ,, ...	0	0	5½	0	0	6½
Honduras ,, ...	0	0	5½	0	0	6½
Box, Turkey ....ton	4	0	0	13	0	0
Rose, Rio	12	0	0	19	0	0
Bahia	10	0	0	18	0	0
Satin, St. Domingo....foot	0	0	9	0	1	3
Porto Rico	0	0	10	0	1	6
Walnut, Italian	0	0	4	0	0	7

METALS.						
IRON—Bar, Welsh, in London tn	6	5	0	6	15	0
,, ,, at works in Wales	5	15	0	6	5	0
,, Staffordshire, in London..	6	5	0	7	0	0
COPPER—British, cake and ingot	56	10	0	57	10	0
Best selected	59	0	0	60	0	0
Sheets, strong	66	0	0	0	0	0
Chili, bars	53	10	0	0	0	0
YELLOW METAL....lb.	0	0	6	0	0	6½
LEAD—Pig, Spanish ....ton	12	16	3	0	0	0
English, com. brands	0	0	0	0	0	0
Sheet, English, 3 lbs. per square foot and upwards....	15	0	0	15	5	0
Pipe	15	10	0	0	0	0
ZINC—English sheet ....ton	25	5	0	26	10	0
Vieille Montagne	27	0	0	0	0	0
TIN—Straits	91	10	0	0	0	0
Australian....	92	0	0	0	0	0
English Ingots....	94	10	0	0	0	0

OILS.						
Linseed ....ton	22	0	0	22	7	6
Cocoanut, Cochin	33	10	0	34	0	0
,, Ceylon	28	0	0	28	5	0
Palm, Lagos	25	5	0	25	10	0
Rapeseed, English pale	29	5	0	0	0	0
,, brown	27	5	0	27	10	0
Cottonseed, refined	18	0	0	0	0	0
Oleine....	22	0	0	24	0	0
Lubricating, U.S.	6	0	0	7	0	0
,, refined	7	10	0	12	0	0
TAR—Stockholm....barrel	1	1	6	1	2	0
Archangel....	0	14	6	0	0	0

TENDERS.

[Communications for insertion under this heading must reach us *not later than* 12 *noon on Thursdays.*]

ABERGAVENNY.—For supplying warming apparatus to church at the Asylum. Mr. Alfred Swash, architect, Newport, Mon.:—

Davis....	£130 13	Baker & Co.	£124 10
Edwards & Co.	128 4	Hampton, Abergavenny*	106 19

* Accepted.

ARDROSSAN.—For the supply and delivery of 286 tons of 8-inch cast-iron pipes and a few tons of smaller size, for the Police Commissioners. Messrs. J. & A. Leslie & Reid, engineers, 72, George-street, Edinburgh:—

D. J. Stewart & Co.	£1,724 5 1	Laidlaw & Son....	£1,585 15 7
Macfarlane, Strang, & Co....	1,715 8 6	Maclaren & Co., Glasgow*	1,569 17 6
Edington & Sons....	1,689 9 4		

* Accepted.

ARDROSSAN.—For laying a line of cast-iron pipes from reservoir, and constructing filters and tank, waterworks, for the Police Commissioners. Messrs. J. A. Leslie & Reid, engineers, 72, George-street, Edinburgh:—

T. H. Carson....	£2,136 0 0	R. C. Brebner	£1,765 17 10
J. Johnstone....	1,925 5 0	J. Urquhart, Shawlands, Glasgow* ..	1,682 14 7
G. Inglis	1,887 4 2		

* Accepted.

BEDFORD.—For the erection of stabling and shedding, for the Town Council. Mr. John Lund, Borough Surveyor, Corn Exchange, Bedford:—

R. J. Black	£363 16 0	G. E. Fathers	£274 0 0
R. Black....	343 5 0	H. Walker....	273 18 1
G. Todd	295 0 0	W. Freeman....	266 0 0
T. Laughton....	289 2 8	T. H. Coleman....	265 8 0
G. Harrison	289 0 0	J. P. White*....	257 0 0
W. Haynes	275 0 0		

* Accepted.

[All of Bedford.]

CARDIFF.—For forming, metalling, paving, kerbing, and channelling the several streets named hereafter, for the Corporation. Mr. W. Harpur, M.Inst.C.E., Borough Engineer, Town Hall, Cardiff:—

Plasnewydd-place.

Dd. Evans	£398 14 5	T. Harries	£240 7 0
H. & F. Osmoud	296 17 0		

Glenroy-street.

Dd. Evans	£573 6 1	W. Morris	£373 7 1
H. & F. Osmond	434 17 8	T. Harries	364 17 6

Arran-street.

Dd. Evans'....	£656 11 0	M. Lawrence....	£428 5 0
H. & F. Osmond	496 15 0	T. Harries	416 8 6

Keppoch-street.

Dd. Evans	£920 9 3	T. Harries	£582 15 6
H. & F. Osmond....	677 16 6	Gibbon & Geen....	534 14 9

Dock's-lane.

Dd. Evans	£223 14 11	J. Allan	£258 3 0
J. Rich	228 17 9	T. Harries	221 11 6

Claude-road.

Dd. Evans....	£880 8 0	T. Harries	£559 4 6
J. C. Pearson	689 5 6	Rd. Smith....	553 2 0

Ruthven-street.

Dd. Evans	£1,318 15 10	Wilde & Allan....	£837 2 0
T. Rees, jun....	982 14 0	T. Harries....	810 14 2

Cottrell-road.

Dd. Evans	£447 18 5	Rd. Smith....	£325 12 0
J. C. Pearson	349 7 6	T. Harries..	302 16 0

Treharris-street.

Dd. Evans	£255 11 3	H. & F. Osmond....	£191 7 5
J. C. Pearson	203 9 9	T. Harries....	177 7 0
Rd. Smith....	191 10 6	J. Rich	149 2 8

Plasnewydd-road.

Dd. Evans	£398 4 5	T. Harries....	£261 3 2
T. Rees, jun....	308 18 0	J. Rich	245 12 7
Gibbon & Geen	372 2 0		

Upper Kincraig-street.

Dd. Evans....	£464 0 3	Wilde & Allen	£294 6 0
H. & F. Osmond....	351 4 7	T. Harries....	286 3 10

CROYDON.—For fitting-up shop and sundry alterations at 109, North End, Croydon, for the Home and Colonial Stores, Limited. Mr. Robert Willey, architect, 66, Ludgate-hill, E.C.:—

Nightingale	£354	M. Taylor (accepted)	£333

CARDIFF.—For general repairs to the abattoirs and cattle markets at Roath and Canton, for the Corporation. Mr. W. Harpur, Borough Engineer, Town-hall, Cardiff:—

Canton Abattoir.

Hy. Davies	£128 13 0	J. Gibson, Cardiff (accepted)	£80 18 0
A. J. Howell	94 0 0		
Thos. Gough....	86 0 0		

Roath Abattoir.

J. Gibson	£147 0 0	A. J. Howell	£90 0 0
Hy. Davies	98 17 6	Thos. Gough, Cardiff (accepted)	80 0 0
E. Williams	92 14 0		

DARWEN.—Accepted for building a Liberal Club at Chapels, Darwen. Mr. J. B Thornley, architect, 45, Market-street, Darwen:—

B. Lloyd & Son, *Masons and Bricklayers*	£318 0 0
Whalley & Walmsley, *Joiners*....	158 0 0
Parkinson Bros., *Plasterers and Painters*	26 0 0
Duffy & Wrighton, *Plumbers*	38 0 0
H. Baron, *Slater*	22 0 0
[All of Darwen.]	
Total	£562 0 0

EGHAM.—For making good, metalling, &c., Hummer-lane, Denham-road, and Crown-street, for the Windsor Rural Sanitary Authority. Mr. William Menzies, Surveyor, Surbiton House, Englefield-green, near Egham, Surrey:—

Franks	£1,365 0 0	Free....	£1,247 10 0
Talbot	1,347 0 0	Oades Bros.	1,243 0 0
Wheeler	1,315 0 0	Baigent & Beauchamp	1,227 16 0
Hes	1,251 0 0	G. & C. Allen	1,170 15 0

GUILDFORD.—For the erection of a new house, London-road, Guildford, for the Hon. J. R. D. Tollemache. Mr. A. J. Sturges, architect, 4, High-street, Guildford. Quantities supplied:—

Mitchell Bros.	£3,426	G. Strudwick	£3,120
T. E. Downes	3,290	R. Smith	2,949
G. Garnett....	3,200	R. Wood....	2,858
Stanley Ellis....	3,189	T. H. Kingerlee	2,667
W. Smith & Sons....	3,146	P. C. May, Guildford*	2,595

* Accepted.

LEEDS.—Accepted for the erection of a new club-house in Ash grove, for the Hyde-park (Leeds) Recreation Club, Limited. Mr. Walter A. Hobson, architect and surveyor, 82, Albion-street, Leeds:—

Excavator, Bricklayer, and Mason work—William Evans, Skinner-lane, Leeds	£500 0 0
Carpenters' and Joiners' work—J. Ledgard & Son, Ventnor-street, Leeds....	390 0 0
Slaters' work—James Season, Hunslet-lane, Leeds	37 10 0
Plumbers', Glaziers', and Gas-fitters' work—Harry Boston, Reservoir-street, Leeds	76 0 0
Plasterers' and Concreters' works—Henry Pearson, Ravensburgh-street, Leeds	95 0 0
Painters' work—Joseph Walker	20 14 0
	£1,119 4 0

LEICESTER.—For alterations and additions to brewery, Lower Charnwood-street, Leicester, for the Leicester Brewing and Malting Company (Limited). Messrs. Inskipp & Mackenzie, architects, 5, Bedford-row, W.C. Quantities by Messrs. R. L. Curtis & Sons:—

M. Hickling	2,460	Clark & Garret....	£2,284
N. Elliot	2,325	T. Hutchinson & Son....	2,172
G. Duxbury & Son	2,295	[All of Leicester.]	

LIVERPOOL.—For erecting St. Bede's Vicarage, Hartington-road, Liverpool. Messrs. Wm. G. Habershon & Fawckner, architects, 38, Bloomsbury-square, W.C.:—

Morrison & Sons	£2,511	Tomkinson & Sons....	£2,077
Gabbutt	2,187	Jones & Sons....	1,999
Haigh	2,096	Holme & Green	1,964

[All of Liverpool.]

LONDON.—For erecting new Weights and Measures Office at Newington, for the London County Council. Mr. Thomas Blashill, Architect:—

Hart Bros....	£4,178	F. T. [Churcher....	£3,800
B. E. Nightingale	4,110	C. Horton	3,779
J. Shillitoe & Son	4,034	J. Garratt & Son	3,765
T. L. Green	3,993	Co-operative Builders	3,725
W. Akers & Co.	3,957	W. Buckeridge....	3,700
G. E. Bryan & Son	3,944	Stimpson & Co.	3,620
C. Ansell	3,907	R. G. Bentley	3,610

LONDON.—For public conveniences at Dulwich Park, for the London County Council. Mr. Thomas Blashill, Architect:—

Finch	£670	Wallis	£572
Stidder	627	Akers....	530
Channing	625	Mills	469
Garratt	589		

LONDON.—For alterations at 9, Paternoster-row, E.C. Mr. Robert Williams, arhitect:—

W. S. King	Time 9 weeks	Total	£1,017	0	0
Eriner & Son	,, not stated....	,,	792	0	0
Outhwait & Son....	,, 6 weeks	,,	639	0	0
W. Vanstone	,, 8 ,, ...	,,	626	0	0

LONDON.—For making-up, paving, &c., of two roads in the parish of Fulham, for the Vestry. Mr. W. Sykes, New Streets Surveyor:—

Greenham	£1,659	Nowell & Robson....	£1,358
Tomes & Wimpey	1,431	Bell*	1,294
Killingback	1,405		

* Accepted.

LONDON.—For making up, paving, &c., of seven roads in the parish of Fulham, for the Vestry. Mr. W. Sykes, New Streets Surveyor:—

Greenham	£4,042	Tomes & Wimpey (accepted)	£3,328
Nowell & Robson....	3,688	Killingback (withdrawn)..	3,131

LONDON.—For excavation and foundations for new factory and warehouse at Golden-lane, for Messrs. J. & R. Morley. Mr. H. J. Treadwell, architect:—

Ashby Bros. (accepted: time, 8 weeks)	£4,385	0	0

[For full list see *Builder*, January 17, p. 57.]

LONDON.—For erecting new Baptist chapel at Honor Oak, S.E. Mr. George Baines, architect, 4, Great Winchester-street, E.C.:—

Higgs & Hill	£6,300	G. Dobson	£5,960
H. L. Holloway	6,174	F. & H. F. Higgs....	5,883
L. Rider & Son....	6,030	R. G. Battley	5,693
Holliday & Greenwood	5,993	S. J. Scott, 3, Bloomfield-street, E.C. (accepted) ..	5,497
S. J. Jerrard....	5,977		

[Architect's estimate, £5,500.]

LONDON.—For alterations to the "Lord Palmerston" public-house, Hampstead-road, N.W. Messrs. Furniss & Thorpe, architects, 60, Kentish Town-road:—

Drew & Cadman	£2,268	Anley	£1,976
Perkins	2,093	Gould & Brand*	1,893
Toms	2,037		

* Accepted.

LONDON.—For additions, alterations, and fittings at "The Beaufoy Arms," Lavender-hill, for Mr. P. J. Upright. Mr. D. Carmichael, architect:—

S. & L. W. Ransom (accepted)....	£550	0	0

[No competition.]

LONDON.—For building stable and coach-house at Tinnison-road, South Norwood, for Mr. Horris Parks:—

Bryan & Son	£275 10	Bulled & Co.	£258 0
Page	265 0	Marriage	242 0
Horrocks	260 0	M. Taylor (accepted)	229 0

LONDON.—For additions and stabling to No. 7, Maplesbury-road, Broudesbury, N.W., for Mr. J. M. Mitchell. Messrs. Physick & Lowe, architects, 95, Park-street, Grosvenor-square :—

Gould & Brand, amended estimate (accepted) .. £1,214 0 0

LONDON.—For the erection of a furniture repository in Musjid-road, Battersea, for Messrs. Arding & Hobbs. Messrs. Tolley & Son, architects :—

J. Carmichael	£2 620 0 0	W. Hammond	£2,191 0 0
W. Marriage	2,473 0 0	R. Jewell*	2,189 10 0
T. Capel	2,440 0 0		

* Accepted.

LONDON.—For alterations and additions to Regent House, Kirkdale, Sydenham, for Mr. W. Cobb. Messrs. Tolley & Son, architects :—

Bulled & Co.	£497	J. Waddington	£389
Smith & Sons	405	W. Marriage (accepted)	380

LONDON.—For decorative and sanitary work at 41, Garden-square, W.C. (exclusive of fittings), for Mr. A. J. Simmons :—

Wm. Tout, Hendon (accepted) £126 0 0

MANCHESTER.—For alterations to house at Heaton Mersey, for Mr. S. Bersi. Mr. J. D. Harker, architect :—

John Rhodes	£367	John Bland	£315
Ed. Wood	359	Burgess & Galt (accepted)	307

MORLEY (Leeds).— For the construction of a storage reservoir at the Withens, for the Morley Corporation. Mr. Chas. Gott, M.Inst.C.E., Engineer, 8, Charles-street, Bradford, Yorks. :—

Henry Vickers	£49,800 0 0	Schofield, Sons, & Co.	£36,950 15 0
S. Pearson & Son	48,300 0 0	Crabtree Brothers	34,828 3 3
John Dunkin & Son	47,415 19 5	Benjamin Lumb	34,452 14 5
Parkinson & Bower	41,288 1 6	David Barry	33,844 0 0
Enoch Tempest	37,210 0 0	H. Fotherby & Son, Burnley, Lancs.*	32,627 10 5
Walter Binns	37,128 18 6		

* Accepted.

NEWPORT (Mon.).—For rebuilding business premises, Commercial-road, for Mr. Jno. Phillips. Mr. Alfred Swash, architect and surveyor, 3, Friars-chambers, Newport, Mon. :—

T. G. Diamond	£2,232 0 0	E. Richards	£1,693 0 0
W. Price	1,993 0 0	R. Williams & Son	1,690 0 0
W. Blackburn	1,971 0 0	Thos. Webb, 1, Kirby street, Newport*	1,684 0 0
J. Linton	1,950 0 0		
Moulton & Brownscombe	1,840 0 0		

* Accepted.

NEWPORT (Mon.).—For supplying shop fittings at No. 85, Commercial-road, for Mr. Jno. Jones. Mr. Alfred Swash, architect and surveyor, 3, Friars-chambers, Newport, Mon. :—

Bartlett & Son	£146 0 0	Parnall & Son	£125 0 0
Jones & Son	145 0 0	E. Richards, Newport*	125 0 0

* Accepted.

OXTED (Surrey).—For building house at Oxted, Surrey. Mr. Ellis Marsland, architect, 9, Pembridge-road, W. :—

Money Marsland, North-street, Wandsworth* .. £1,150 0 0

* Accepted.

PINNER (Middlesex).—For the erection of residence, lodge, and greenhouses. Mr. A. Ashbridge, architect :—

Dawson	£2,623	Eaton	£1,899
Weston	2,416	Kirby & Sons	1,879
Batchelor	2,207	Atherton & Latta	1,728

READING.—For the erection of a suite of offices, leather-rooms, store-rooms, and engineering workshops at Reading, for Mr. H. Lewis. Mr. Walter H. Bell, architect, Newbury :—

W. H. Simonds	£1,680	J. A. Sims	£1,400
Claridge & Bloxham	1,649	G. & T. Ruffell	1,280
F. Hawley	1,585	T. Pilgrim	1,163
G. Wernham	1,550	T. H. Kingerlee, Oxford*	1,065

* Accepted.

REDHILL.—For the erection of twenty-four houses for Mr. Richard Trower. Mr. T. Rowland Hooper, architect, Redhill :—

Apted Bros.	£6,672 0	Worssell	£5,999 10
Taylor	6,654 0	Buckland	5,884 0
Simmons	6,620 0	Cook	5,348 0
Carter	6,080 0	Carrick (accepted)	5,200 0

RHONDDA VALLEY.—For the erection of a hotel at Tonypandy, for the Tonypandy Brewery Company. Mr. Thomas Old, architect, Tonypandy :—

John D. Williams	£2,900 0	David Jones	£2,331 0
John Hopkins	2,617 13	John Haines, Cardiff*	2,226 0

* Accepted.

SAWBRIDGEWORTH.—For making about 900 yards of roadway on the Spring Hall Estate. Mr. A. U. Higgins, surveyor, 89 and 90, Leadenhall-street, London, E.C :—

Walter Gladding	£397 0 0	W. H. Wheeler, Southwark Bridge, E.C.*	£208 0 0
Coulson & Lofts	296 0 0	J. Jackson (withdrawn)	170 0 0
J. Bloomfield	250 0 0		
A. Fairall	234 18 0		
Geo. Bell	222 0 0		

* Accepted.

SHEFFIELD.—For the extension of Plum-lane Mortuary, Sheffield. Mr. Charles F. Wike, Borough Surveyor, Sheffield :—

W. & A. Forsdike	£190 0 0	J. Morton	£148 0 0
T. Lowe & Sons	177 12 4	J. Eshelby	147 0 0
Ash, Son, & Biggin	160 0 0	J. Maslin & Son, Sheffield*	145 0 0
B. Powell & Sons	158 0 0		
Longden & Son	154 0 0		

* Accepted.

TONBRIDGE.—For the erection of a north aisle to the chapel at Tonbridge School, for the Worshipful Company of Skinners. Mr. E. H. Burnell, Surveyor to the Company, 32, Bedford-row, W.C., architect. Quantities by Mr. W. R. Mallett, 35, Great St. Helens, E.C. :—

W. J. Mitchell	£895 0	C. J. Gallard	£623 0
G. Mansfield & Son	760 0	E. Punnett	587 10
Langdale & Hallett	700 0	Strange & Son, Tunbridge Wells (accepted)	586 0
J. Greenwood	632 0		

WEST HAM.—For Main Drainage Extension Works, West Ham. Contract No. 11. Mr. Lewis Angell, Borough Engineer :—

Griffiths & Co.	£6,475	Cooke & Co	£5,984
Bell	6,430	J. Jackson, Plaistow*	5,500

* Accepted.

WOLVERHAMPTON.—For the erection of a villa residence at Compton, near Wolverhampton, for Mr. A. W. Sims. Mr. Joseph Lavender, architect, Wolverhampton :—

H. Gough	£779	B. Guest	£750
C. Ford & Sons	778	H. Willcock	750
G. Cave	759	Bradney & Co. (accepted)	736

[All of Wolverhampton.]

WOLVERHAMPTON.—For structural alterations to furniture shop, High-street, for Messrs. T. Edwards & Son. Mr. Joseph Lavender, architect, Wolverhampton :—

H. Gough, Wolverhampton (accepted) £120 0 0

WORMINGFORD.—For new cast-iron girder bridge over the "Stour," for the County Councils of Essex and West Suffolk. Mr. Henry Stock, London, and Mr. F. Whitmore, Chelmsford, joint architects :—

Geo. Bell	£1,930	H. Runnacles	£1,348
B. Cooke & Co.	1,650	F. Johnson	1,180
Alf. Thorne	1,500	Geo. Double, Ipswich*	1,050

* Accepted.

WORTLEY.—For the construction of a pipe-sewer, manholes, &c., in Station-road, Chapeltown, for the Union Rural Sanitary Authority :—

Dearden & Jackson	£210 10 6	Hy. Burrows	£173 0 0
Chas. Lomas	190 0 0	Amos Ward	168 0 0
G. J. Helliwell	189 10 0	F. Haywood, Wortley*	147 0 0
F. & T. Bool	183 11 0		

* Accepted.

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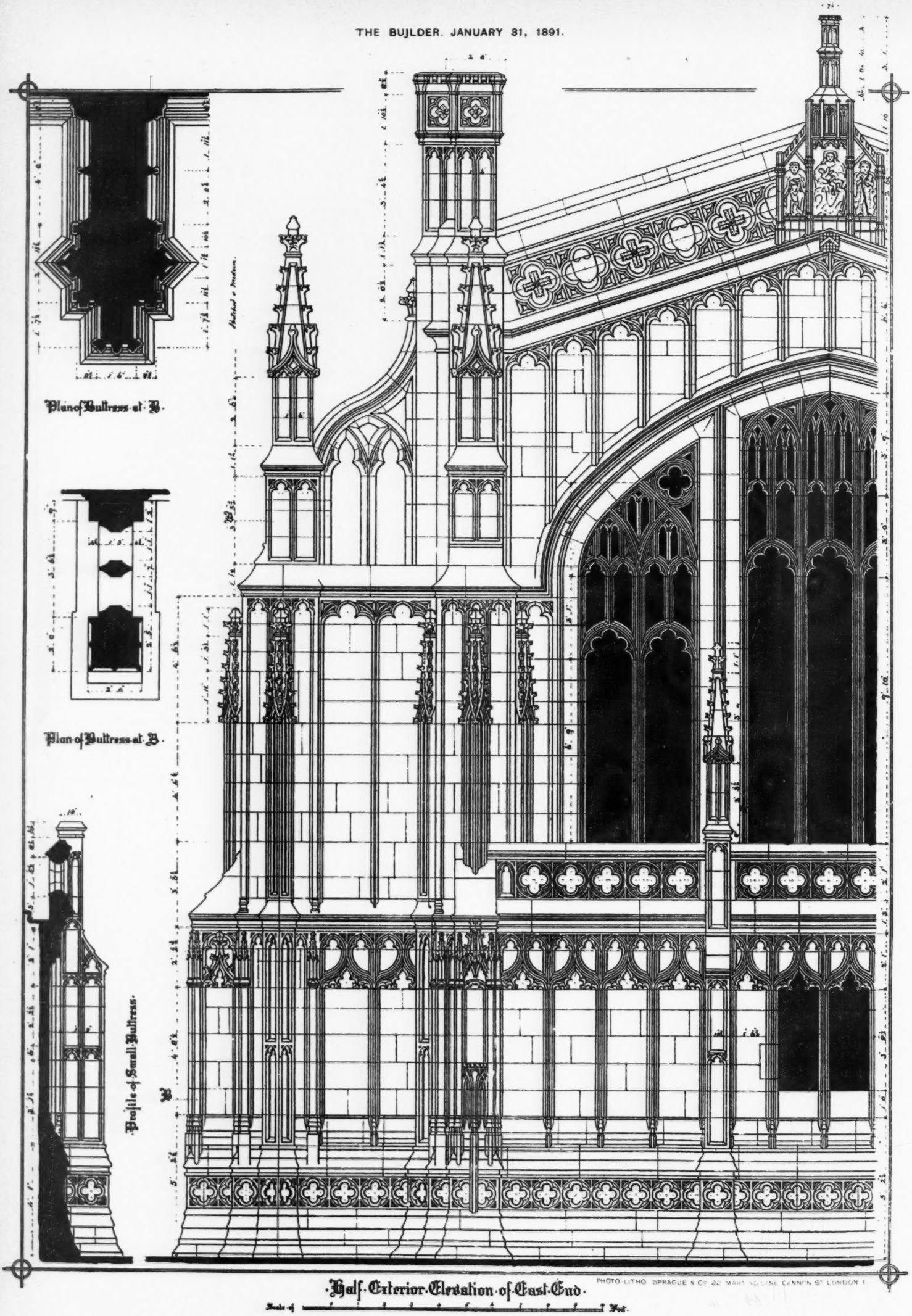
LONDON: 352 to 362, EUSTON ROAD.
LIVERPOOL: 6 and 8, HATTON GARDEN.
GLASGOW: 47 & 49, ST. ENOCH SQUARE.

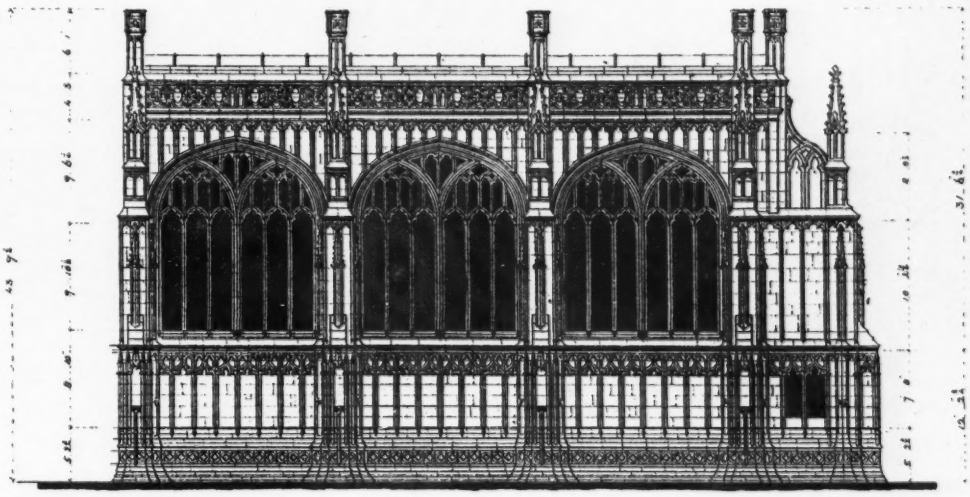

Plan of Buttress at B.
Plan of Buttress at B.
Profile of Small Buttress.
Half Exterior Elevation of East End.
PHOTO-LITHO SPRAGUE & Co 25 MARYLEBONE LANE CANNON ST LONDON E

THE BEAUCHAMP CHAPEL, WARWICK.—Measured and Drawn by Mr. Harold Brakspear.

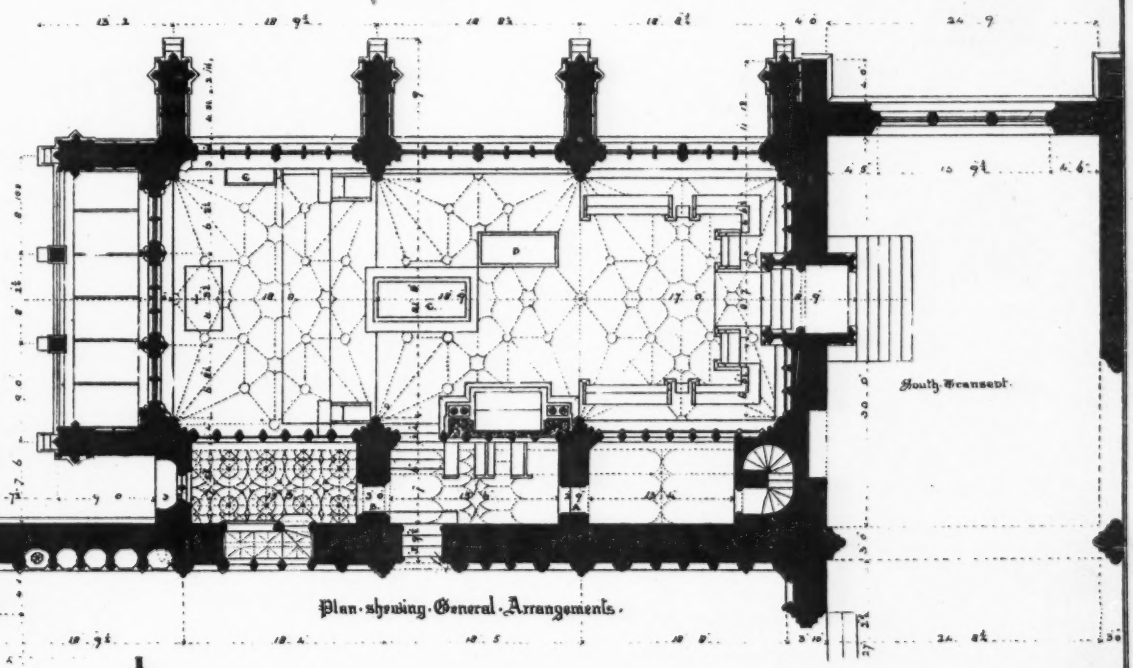
"Honourable Mention" for Institute Silver Medal, 1891.

Escutcheon to Door at A.

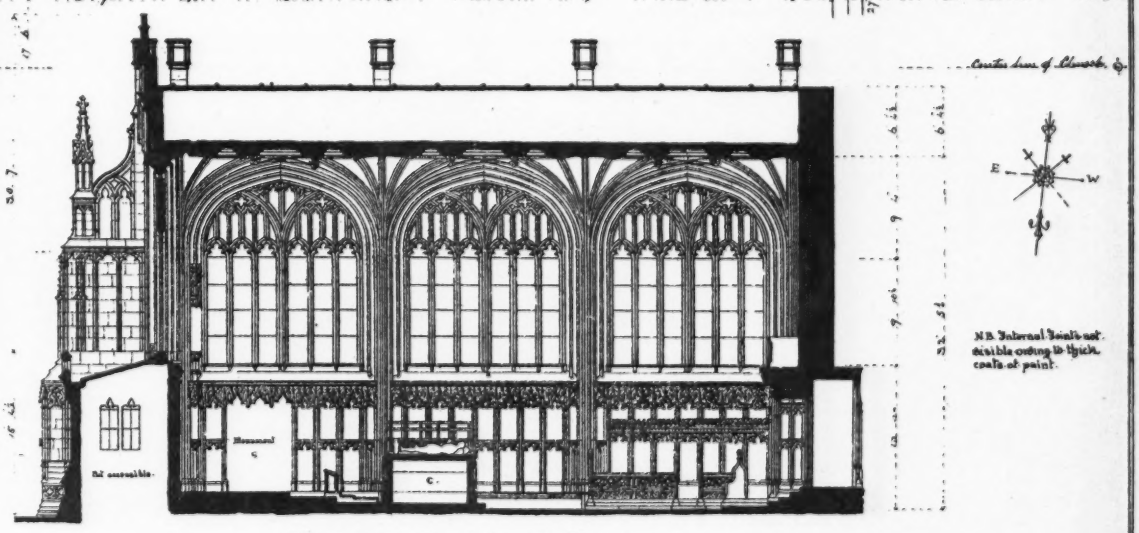
Escutcheon to Door at B.



Elevation of South Side.



Plan shewing General Arrangements.



Longitudinal Section looking South.

References to Monuments.

C. Richard Beauchamp Earl of Warwick Died 1439.
D Ambroise Dudley K.G. Earl of Warwick.
E Robert Dudley Baron of Denbigh.
F Robert Dudley Earl of Leycester & Letitia his wife.

Note.

The Chapel was built by the Execrs of Rich. Beauchamp begun 1443 the cost amounted to £2481. 4. 7½ & was consecrated 1475 by John Hales Bp of Coventry & Lichfield.
The Choir was built by the Execrs of the Beauchamp about 1370.
The rest of the church was built by Sr. Chas. Wilson in a debased style about 1702.

Bloxham War. Churches.

N.B. Internal Joints not visible owing to thick coats of paint.

PHOTO-LITHO. SPRAGUE & Co. 22. MARTINS LANE, CANNON ST. LONDON, E.C.

Scale of 0 5 10 15 20 25 30 35 40 45 50 Feet.

THE BEAUCHAMP CHAPEL, WARWICK.—Measured and Drawn by Mr. Harold Brakspear.

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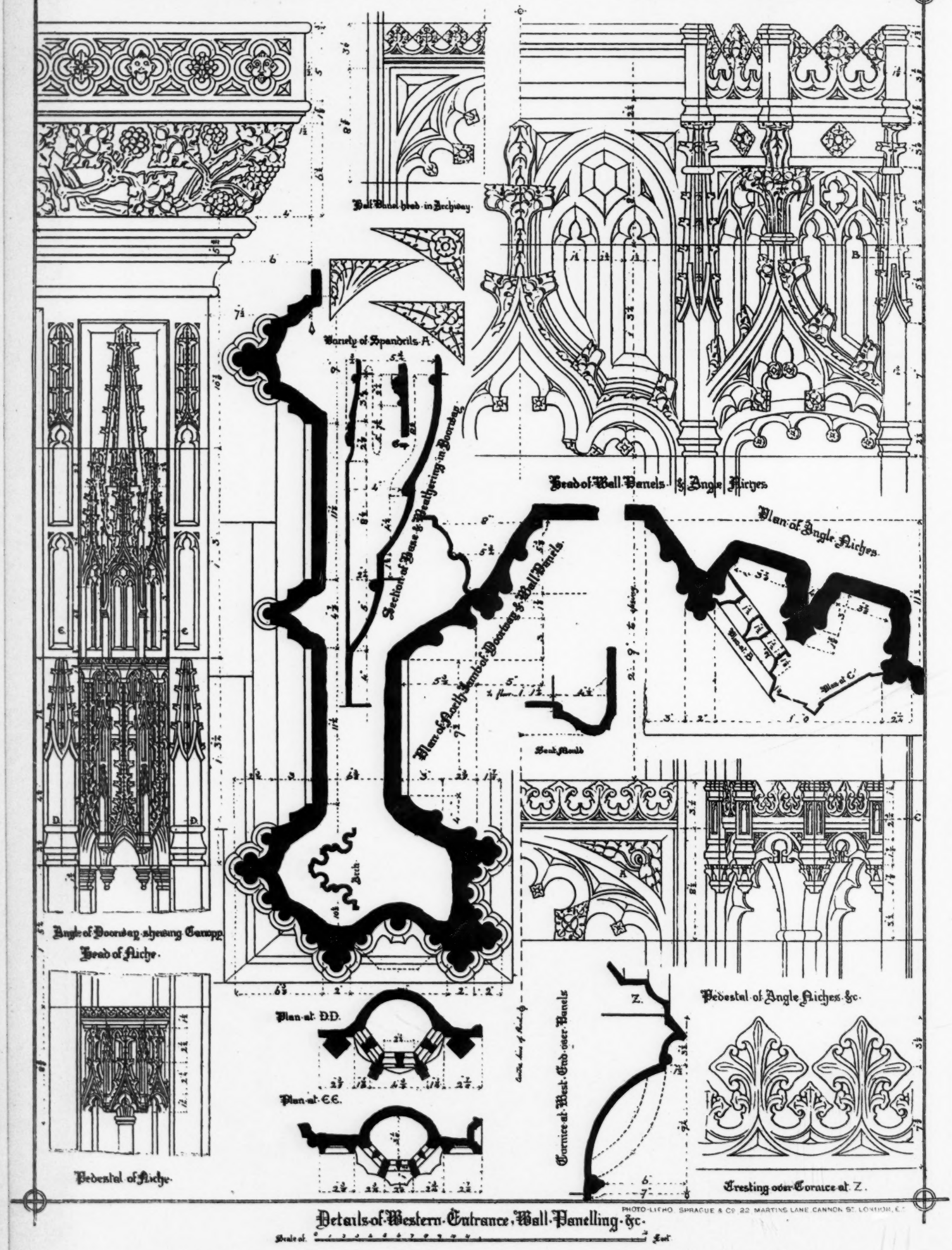
Bell Vaunt bred in Archway
Variety of Spandrils A
Head of Wall Panels & Angle Niches
Plan of Angle Niches
Section of Base & Feathering in Doorway
Plan of North Jamb of Doorway & Wall Panels
Boak Mould
Arch
Angle of Doorway shewing Canopy Head of Niche
Plan at D.D.
Plan at E.E.
Pedestal of Niche
Cornice at West End over Panels
Pedestal of Angle Niches &c
Cresting over Cornice at Z.
Details of Western Entrance, Wall Panelling &c.
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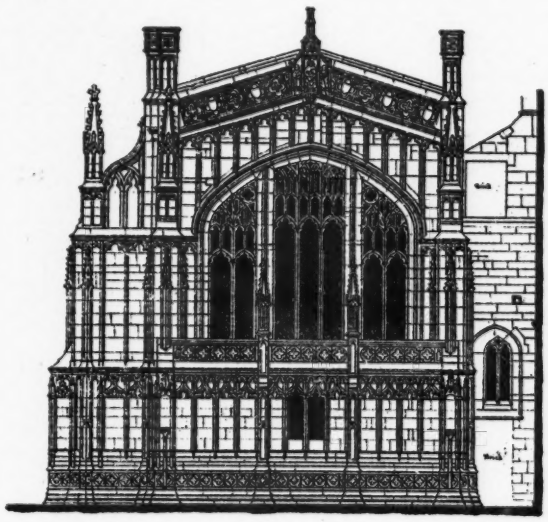
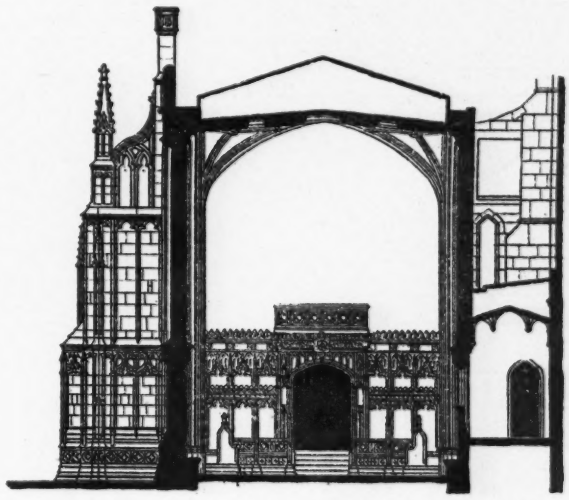
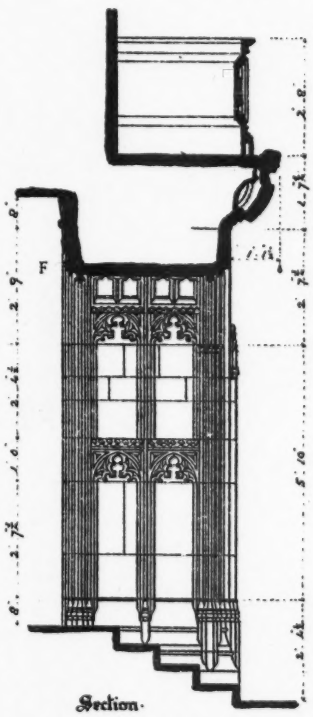


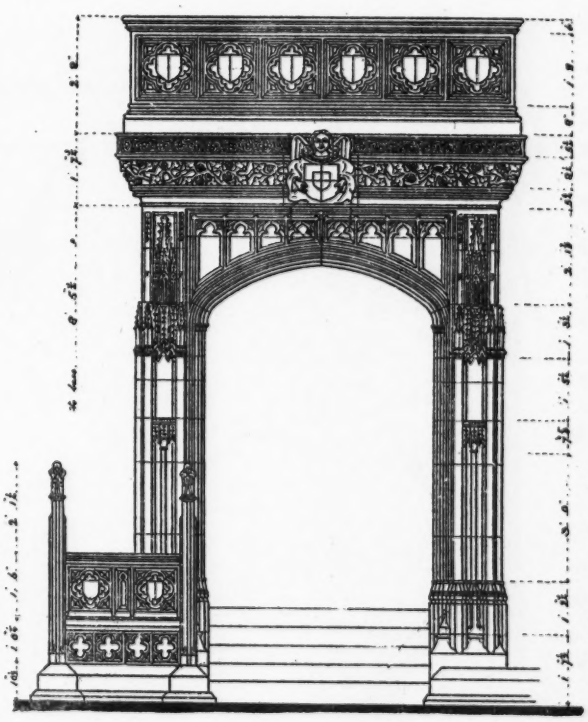
Elevation of East End.



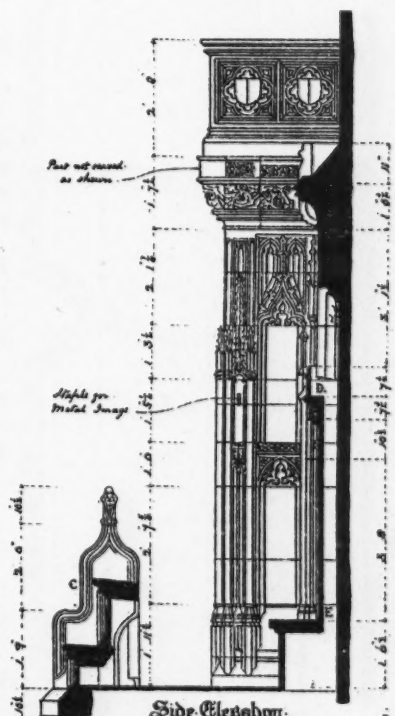
Cross Section looking West.



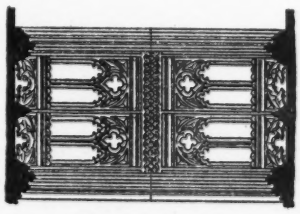
Section.



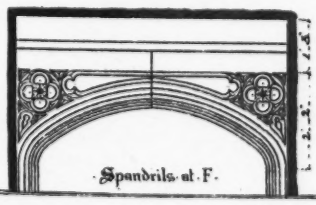
Interior Elevation.



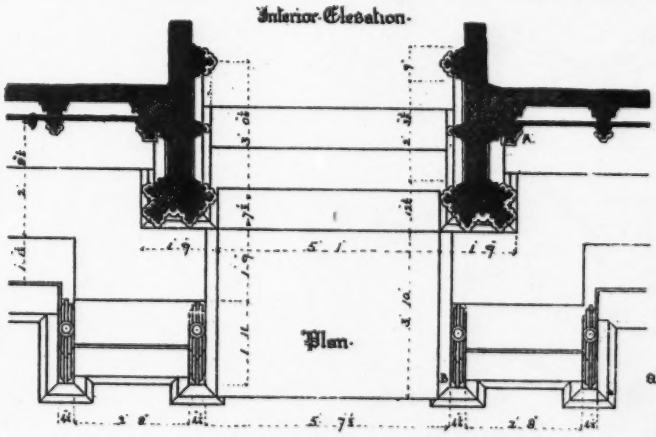
Side Elevation.



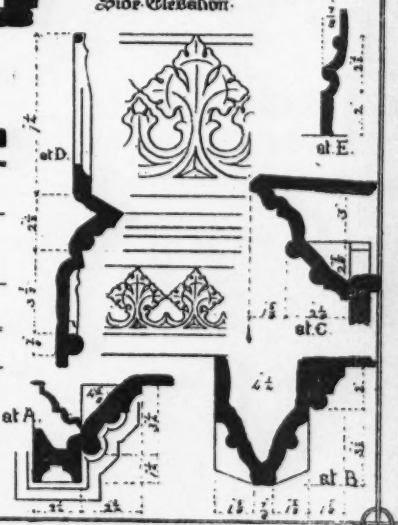
Plan of Ceiling.



Spandrils at F.



Plan.



Details of Western Entrance.

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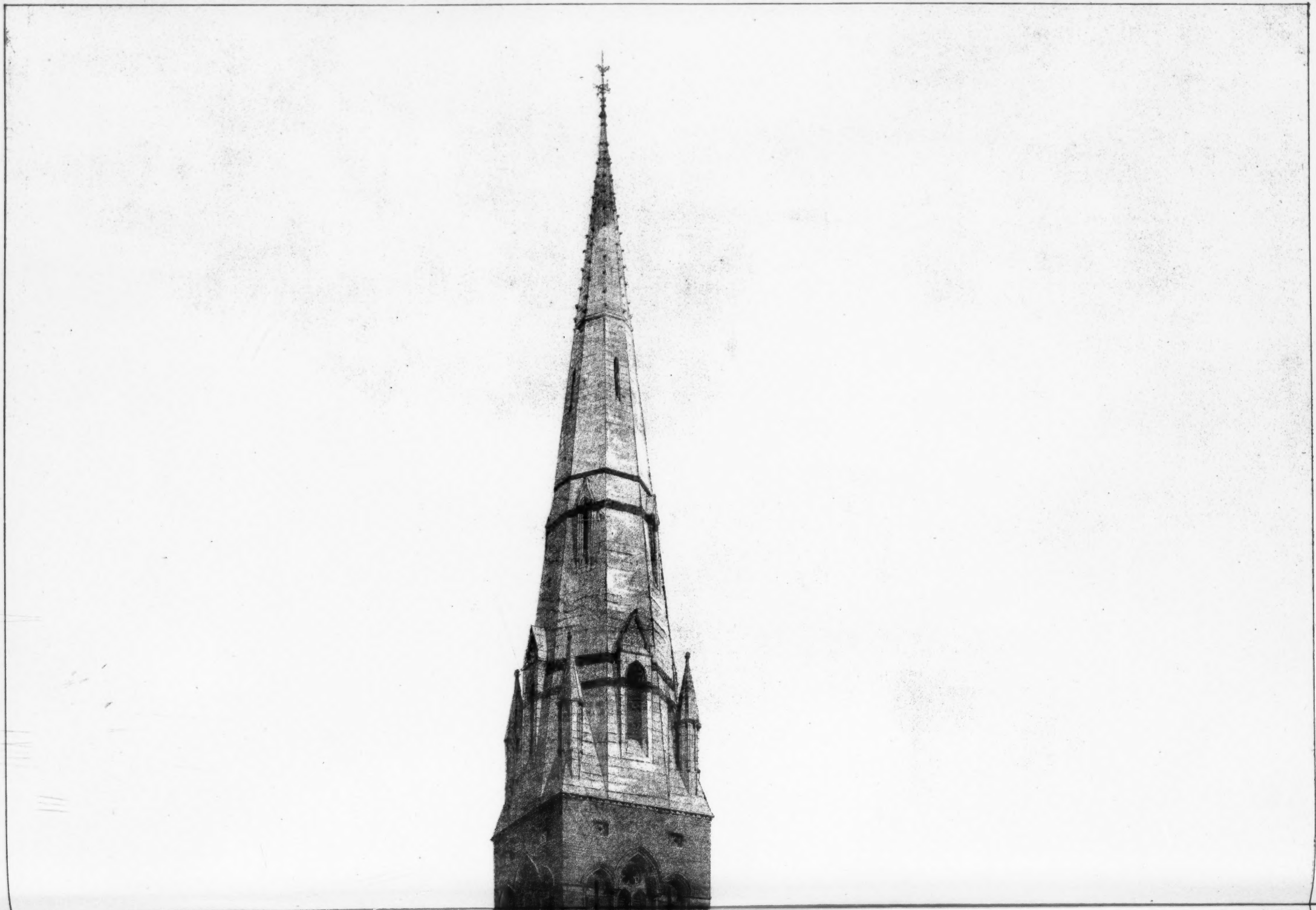

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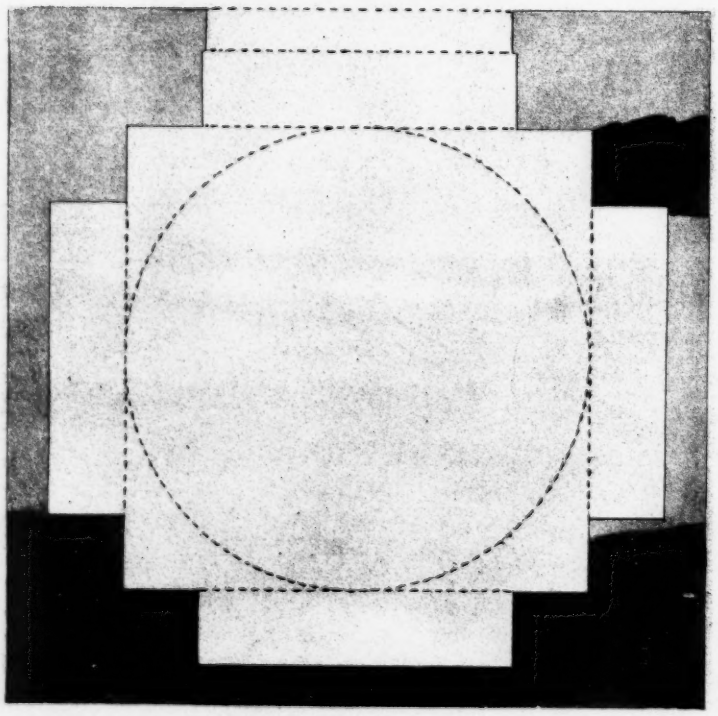
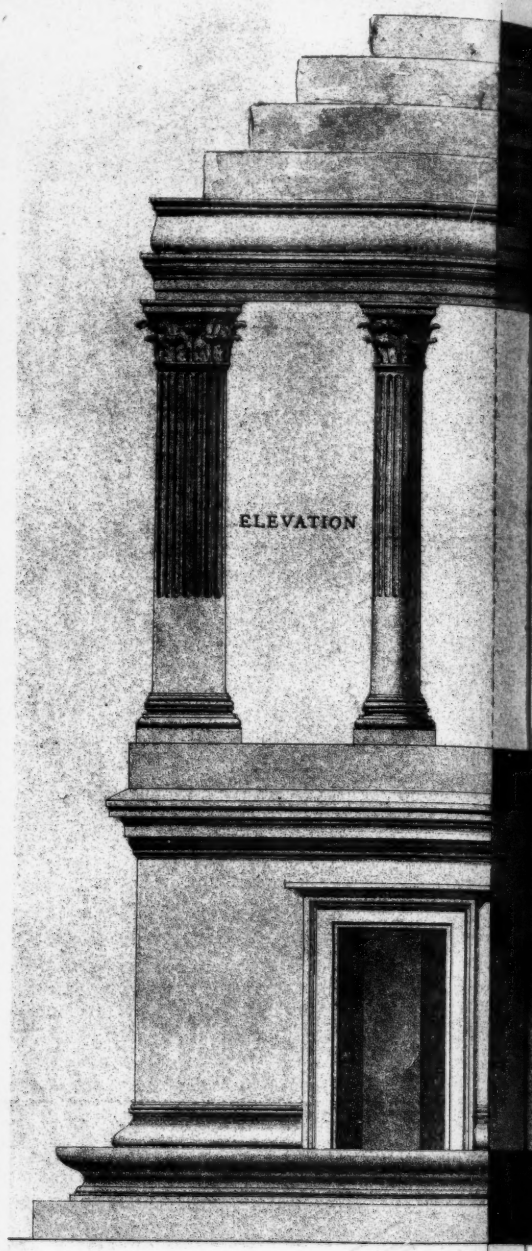
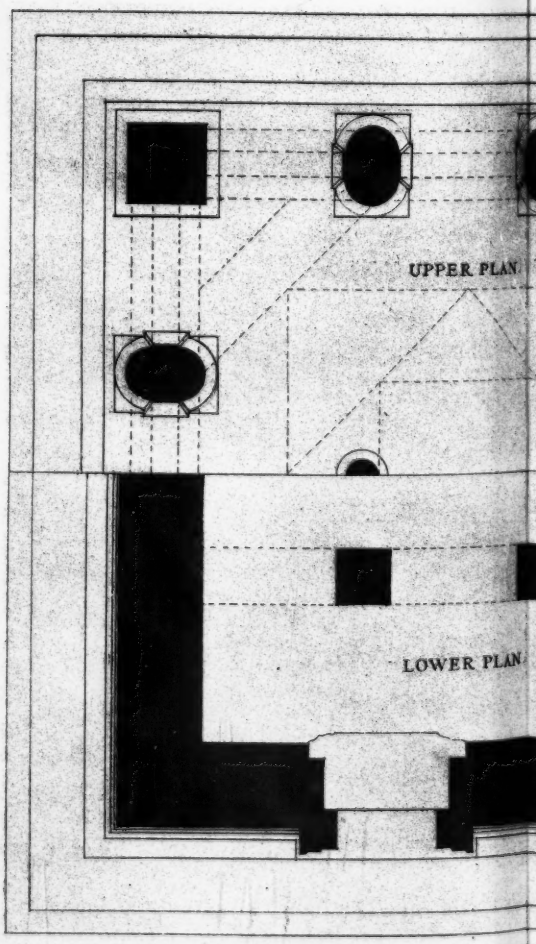


PLAN, FERACHBAD.



SEPULCHRAL MONUME



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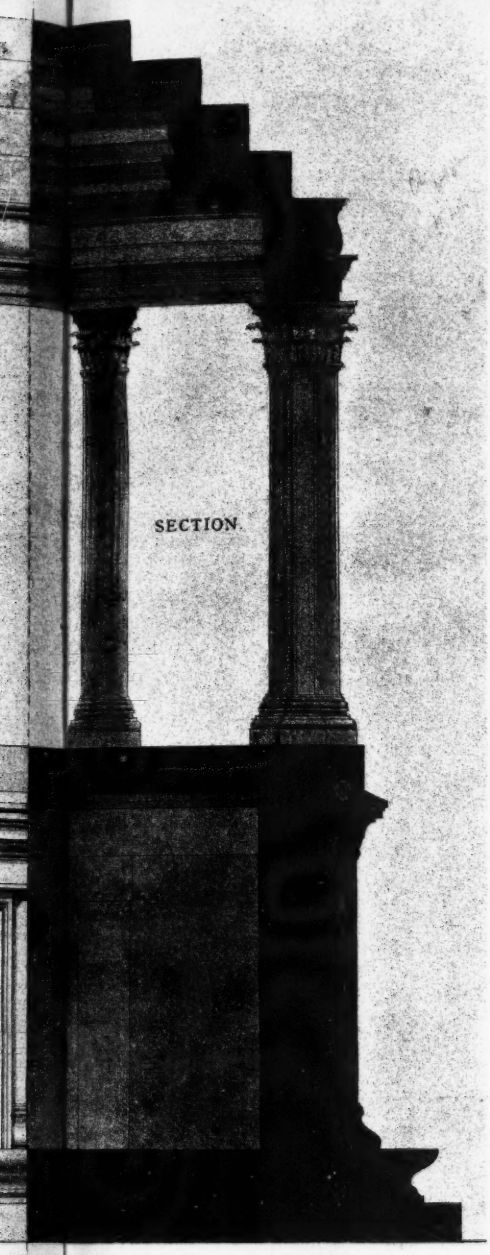
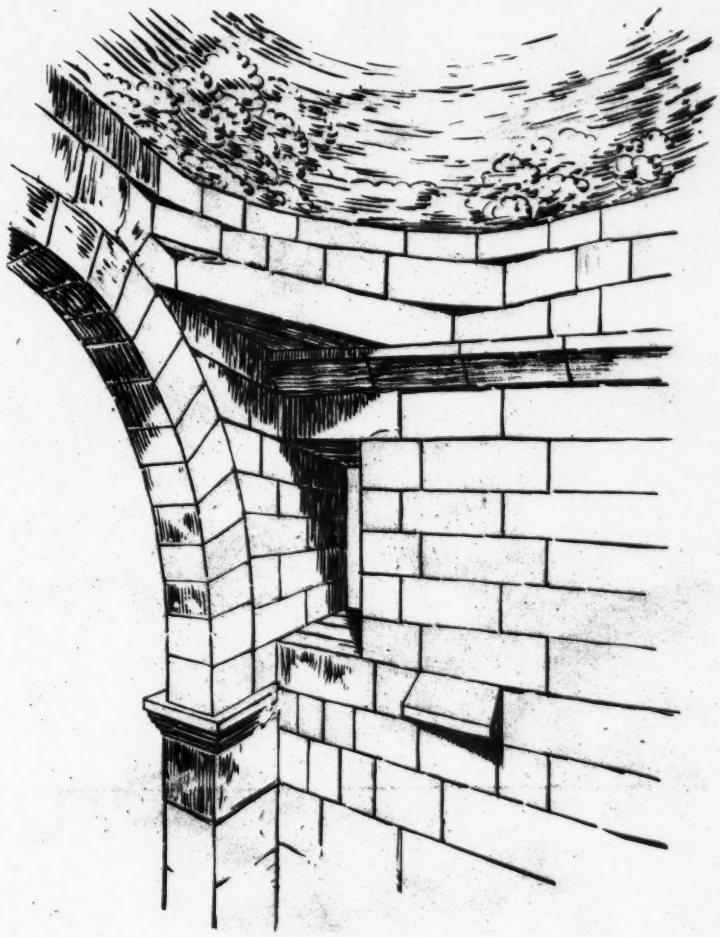
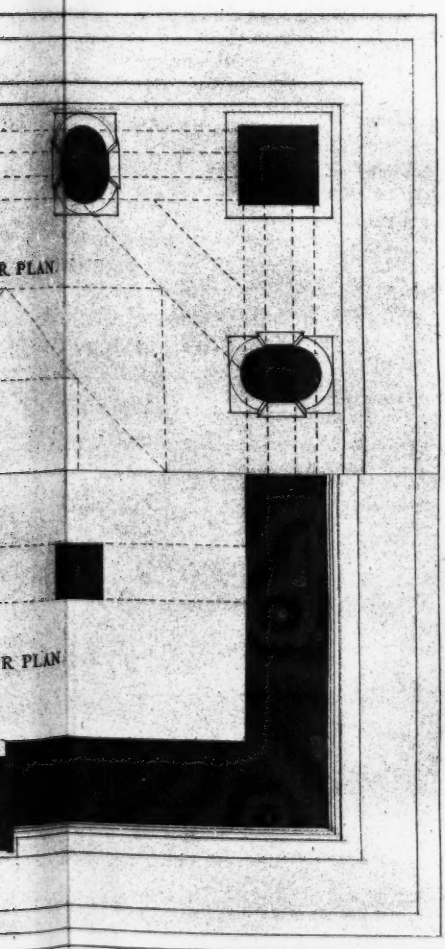
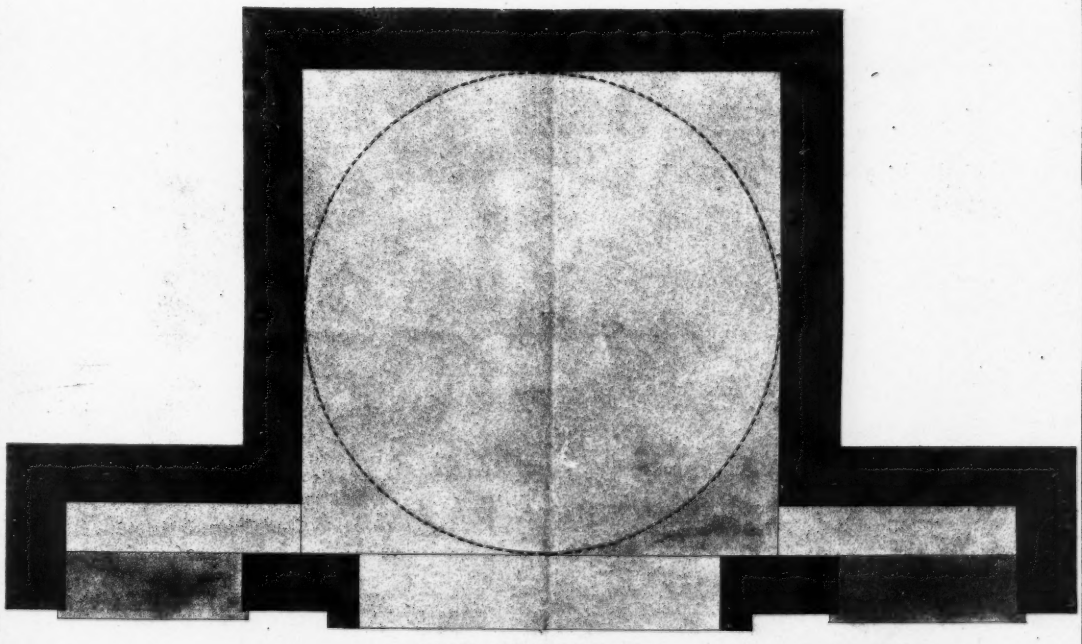


IONUMENT, MYLASSA.



DETAIL OF CUPOLA, OMM-ES-ZEITOUN.





PLAN, OMM-ES-ZEITOUN.

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